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ABSTRACT

Designed to facilitate the research related to the preparation and presentation of arguments for the intercollegiate debate topic, this manual summarizes issues surrounding educational reform and quality control in American elementary and secondary schools. The excerpts from books, periodicals, and other sources not always readily available to public or research libraries included in this manual were selected to provide background information, an overview of the principal issues, and a balance of opposing views. The five sections of the manual focus on the following areas: (1) background and overview of educational reform; (2) school effectiveness and quality, testing, and general achievement; (3) achievement and curricular problems; (4) curricular solutions; and (5) teachers, school administration, and school finance. Also included in the manual are a selected bibliography of materials on the intercollegiate debate topic, a guide to information sources, and a list of available government publications on the intercollegiate debate topic. (HTH)

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Should More Rigorous Academic Standards Be Established For All Public Elementary and/or Secondary Schools in the United States?

Intercollegiate Debate Topic
1985-1986

Pursuant to Public Law 88-246

Compiled by the Congressional Research Service
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PUBLIC LAW 88-246, 88TH CONGRESS, S. 2311,
DECEMBER 30, 1963

AN ACT To provide for the preparation and printing of compilation of materials relating to annual national high school and college debate topics.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Librarian of Congress is authorized and directed to prepare compilations of pertinent excerpts, bibliographical references, and other appropriate materials relating to (1) the subject selected annually by the National University Extension Association as the national high school debate topics and (2) the subject selected annually by the American Speech Association as the national college debate topic. In preparing such compilations the Librarian shall include materials which in his judgment are representative of, and give equal emphasis to, the opposing points of view on the respective topics.

Sec. 2. The compilations on the high school debate topics shall be printed as Senate documents and the compilations on the college debate topics shall be printed as House documents, the cost of which shall be charged to the congressional allotment for printing and binding. Additional copies of such documents may be printed in such quantities and distributed in such manner as the Joint Committee on Printing directs.

Approved December 30, 1963.

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Congressional Research Service
The Library of Congress

Washington, D.C. 20540

FOREWORD

The 1985-1986 Intercollegiate debate topic is "Resolved: that more rigorous academic standards should be established for all public elementary and/or secondary schools in the United States, in one or more of the following areas: language arts, mathematics, natural science."

In compliance with Public Law 88-246, the Congressional Research Service of the Library of Congress prepared this compilation of materials and bibliographic references to assist collegiate debaters in researching this year's topic. The excerpts from books, periodicals, and other documents were selected to provide background information, an overview of the principal issues, and a balance of opposing views. We also included some materials that are not readily available in public or research libraries. Bibliographic references were also chosen to provide a wide range of information and opinions. In selecting items for this reader and bibliography, the Congressional Research Service (CRS) has attempted to sample the wide spectrum of opinions reflected in current literature on these questions. No preference for any policy is indicated by the selection or positioning of articles herein, nor should one infer CRS disapproval of any policy or article not included.

The selected items have been arranged in five sections: background and overview of educational reform; school effectiveness and quality, testing and general achievement; achievement and curricula problems; curricula solutions; and teachers, school administration, and school finance.

U.S. Government documents listed in the bibliography may be found in most U.S. Government depository libraries which can be identified by your local public library. The Library of Congress cannot distribute copies of these or other materials to the debaters.

Information is included at the end of this volume on additional resources and other publications and associations that may be useful in expanding and updating this compilation. Finally, there is included a list of relevant publications that are available for purchase from the Superintendent of Documents, Government Printing Office.

The documents included in this compilation were selected by Saundra Shirley-Reynolds, Bibliographer in Education and Public Welfare. The bibliography was prepared by Ms. Shirley-Reynolds, with suggestions from James B. Stedman and other members of the Education and Public Welfare Division. William Kaye of the Review Office provided comments and general review of the selections. Ms. Shirley-Reynolds prepared the guide to information sources. Sherry Shapiro, Senior Bibliographer, Library Services Division, coordinated the preparation of this debate manual for publication. Barbara Sanders secured copyright permissions. C. Lee Burwasser, Marianne Gaines, and John White assembled and prepared items for publication. Ann Eschete and Barbara Hall provided the secretarial production of the bibliography and research guide.

The Congressional Research Service wishes to express its appreciation to those copyright holders that have granted permission for the reproduction of materials. Such permission is acknowledged in each instance.

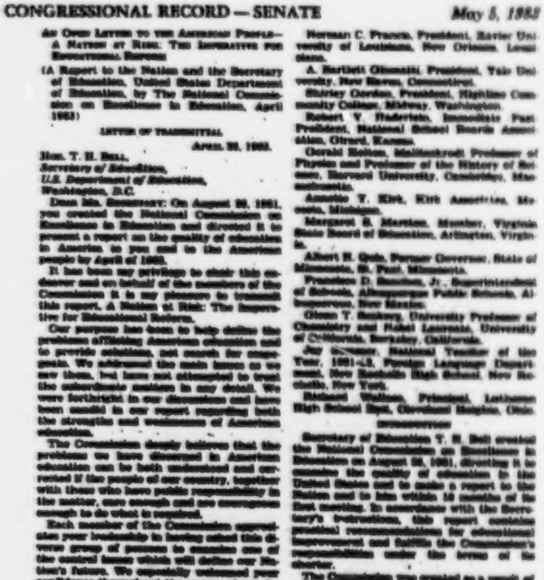
Good luck to each debater in researching, preparing, and presenting arguments on this year's topic.

Gilbert Gude

Gilbert Gude
Director, Congressional Research Service

I. BACKGROUND AND OVERVIEW: EDUCATIONAL REFORM

Reproduced from A Nation at Risk: The Imperative for Educational Reform; An Open Letter to the American People, 1983, National Commission on Excellence in Education, as reprinted in the Congressional Record [daily ed.] v. 129, May 5, 1983: S6096-S6108.



CONGRESSIONAL RECORD — SENATE *May 5, 1983* report of the American Council on Education, "To Strengthen the Quality of Higher Education."

In going about its work the Commission has relied in the main upon five sources of information:

Papers commissioned from experts on a variety of educational issues;

Administrators, teachers, students, representatives of professional and public groups, parents, business leaders, public officials, and scholars who testified at eight meetings of the full Commission, six public hearings, two panel discussions, a symposium, and a series of meetings organized by the Department of Education's Regional Offices;

Existing analyses of problems in education;

Letters from concerned citizens, teachers, and administrators who volunteered extensive comments on problems and possibilities in American education; and

Descriptions of notable programs and promising approaches in education.

To these public-minded citizens who took the trouble to share their concerns with us—frequently at their own expense in time, money, and effort—we extend our thanks. In all cases, we have benefited from their advice and taken their views into account; how we have treated their suggestions is, of course, our responsibility alone. In addition, we are grateful to the individuals in schools, universities, foundations, business, government, and communities throughout the United States who provided the facilities and staff so necessary to the success of our many public functions.

The Commission was impressed during the course of its activities by the diversity of opinion it received regarding the condition of American education and by conflicting views about what should be done. In many ways, the membership of the Commission itself reflected that diversity and difference of opinion during the course of its work. This report, nevertheless, gives evidence that men and women of good will can agree on common goals and on ways to pursue them.

The Commission's charter, the authors and topics of commissioned papers, a list of the public events, and a roster of the Commission's staff are included in the appendices which complete this volume.

A NATION AT RISK

Our Nation is at risk. Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world. This report is concerned with only one of the many causes and dimensions of the problem, but it is the one that undergirds American prosperity, security, and civility. We report to the American people that while we can take justifiable pride in what our schools and colleges have historically accomplished and contributed to the United States and the well-being of its people, the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people. What was unimaginable a generation ago has begun to occur—others are matching and surpassing our educational attainments.

If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war. As it stands, we have allowed this to happen to ourselves. We have even squandered the gains in student achievement made in the wake of the Sputnik challenge. Moreover, we have dismantled essential support systems which helped make those gains possible. We have, in effect, been committing an act of unthinking, unilateral educational disarmament.

Our society and its educational institutions seem to have lost sight of the basic purposes of schooling, and of the high expectations and disciplined effort needed to attain them. This report, the result of 18 months of study, seeks to generate reform of our educational system in fundamental ways and to renew the Nation's commitment to schools and colleges of high quality throughout the length and breadth of our land.

That we have compromised this commitment is, upon reflection, hardly surprising, given the multitude of often conflicting demands we have placed on our Nation's schools and colleges. They are routinely called on to provide solutions to personal, social, and political problems that the home and other institutions either will not or cannot resolve. We must understand that these demands on our schools and colleges often exact an educational cost as well as a financial one.

On the occasion of the Commission's first meeting, President Reagan noted the central importance of education in American life when he said: "Certainly there are few areas of American life as important to our society, to our people, and to our families as our schools and colleges." This report, therefore, is as much an open letter to the American people as it is a report to the Secretary of Education. We are confident that the American people, properly informed, will do what is right for their children and for the generations to come.

The risk

History is not kind to idlers. The time is long past when America's destiny was assured simply by an abundance of natural resources and inexhaustible human enthusiasm, and by our relative isolation from the malignant problems of older civilizations. The world is indeed one global village. We live among determined, well-educated, and strongly motivated competitors. We compete with them for international standing and markets, not only with products but also with the ideas of our laboratories and neighborhood workshops. America's position in the world may once have been reasonably secure with only a few exceptionally well-trained men and women. It is no longer.

The risk is not only that the Japanese make automobiles more efficiently than Americans and have government subsidies for development and export. It is not just that the South Koreans recently built the world's most efficient steel mill, or that American machine tools, once the pride of the world, are being displaced by German products. It is also that these developments signify a redistribution of trained capability throughout the globe. Knowledge, learning, information, and skilled intelligence are the new raw materials of international commerce and are today spreading throughout the world as vigorously as miracle drugs, synthetic fertilizers, and blue jeans did earlier. If only to keep and improve on the slim competitive edge we still retain in world markets, we must dedicate ourselves to the reform of our educational system for the benefit of all—old and young alike, affluent and poor, majority and minority. Learning is the indispensable investment required for success in the "information age" we are entering.

Our concern, however, goes well beyond matters such as industry and commerce. It also includes the intellectual, moral, and spiritual strengths of our people which knit together the very fabric of our society. The people of the United States need to know that individuals in our society who do not possess the levels of skill, literacy, and training essential to this new era will be effectively disenfranchised, not simply from the material rewards that accompany competent performance, but also from the chance to participate fully in our national life. A high level of shared education is essential to a free, democratic society and to the fostering of a common culture, especially in a country that prides itself on pluralism and individual freedom.

For our country to function, citizens must be able to reach some common understandings on complex issues, often on short notice and on the basis of conflicting or incomplete evidence. Education helps form these common understandings, a point Thomas Jefferson made long ago in his justly famous dictum:

"I know no safe depository of the ultimate powers of the society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them but to inform their discretion."

Part of what is at risk is the promise first made on this continent: All, regardless of race or class or economic status, are entitled to a fair chance and to the tools for developing their individual powers of mind and spirit to the utmost. This promise means that all children by virtue of their own efforts, competently guided, can hope to attain the mature and informed judgment needed to secure gainful employment, and to manage their own lives, thereby serving not only their own interests but also the progress of society itself.

Indicators of the risk

The educational dimensions of the risk before us have been amply documented in testimony received by the Commission. For example:

International comparisons of student achievement, completed a decade ago, reveal that on 19 academic tests American students were never first or second and, in comparison with other industrialized nations, were last seven times.

Some 23 million American adults are functionally illiterate by the simplest tests of everyday reading, writing, and comprehension.

About 13 percent of all 17-year-olds in the United States can be considered functionally illiterate. Functional illiteracy among minority youth may run as high as 40 percent.

Average achievement of high school students on most standardized tests is now lower than 26 years ago when Sputnik was launched.

Over half the population of gifted students do not match their tested ability with comparable achievement in school.

The College Board's Scholastic Aptitude Test (SAT) demonstrate a virtually unbroken decline from 1963 to 1980. Average verbal scores fell over 50 points and average mathematics scores dropped nearly 40 points.

College Board achievement tests also reveal consistent declines in recent years in such subjects as physics and English.

Both the number and proportion of students demonstrating superior achievement on the SATs (i.e., those with scores of 650 or higher) have also dramatically declined.

Many 17-year-olds do not possess the "higher order" intellectual skills we should expect of them. Nearly 40 percent cannot draw inferences from written material; only one-fifth can write a persuasive essay; and only one-third can solve a mathematics problem requiring several steps.

There was a steady decline in science achievement scores of U.S. 17-year-olds as measured by national assessments of science in 1969, 1973, and 1977.

Between 1975 and 1980, remedial mathematics courses in public 4-year colleges increased by 72 percent and now constitute one-quarter of all mathematics courses taught in those institutions.

Average tested achievement of students graduating from college is also lower.

Business and military leaders complain that they are required to spend millions of dollars on costly remedial education and training programs in such basic skills as reading, writing, spelling, and computation. The Department of the Navy, for example, reported to the Commission that one-quarter of its recent recruits cannot read at the ninth grade level, the minimum needed simply to understand written safety instructions. Without remedial work they cannot even begin, much less complete, the sophisticated training essential in much of the modern military.

These deficiencies come at a time when the demand for highly skilled workers in new fields is accelerating rapidly. For example:

Computers and computer-controlled equipment are penetrating every aspect of our lives—homes, factories, and offices.

One estimate indicates that by the turn of the century millions of jobs will involve laser technology and robotics.

Technology is radically transforming a host of other occupations. They include health care, medical science, energy production, food processing, construction, and the building, repair, and maintenance of sophisticated scientific, educational, military, and industrial equipment.

Analysts examining these indicators of student performance and the demands for new skills have made some chilling observations. Educational researcher Paul Hurd concluded at the end of a thorough national survey of student achievement that within the context of the modern scientific revolution, "We are raising a new generation of Americans that is scientifically and technologically illiterate." In a similar vein, John Slaughter, a former Director of the National Science Foundation, warned of "a growing chasm between a small scientific and technological elite and a citizenry ill-informed, indeed uninformed, on issues with a science component."

But the problem does not stop there, nor do all observers see it the same way. Some worry that schools may emphasize such rudiments as reading and computation at the expense of other essential skills such as comprehension, analysis, solving problems, and drawing conclusions. Still others are concerned that an over-emphasis on technical and occupational skills will leave little time for studying the arts and humanities that so enrich daily life, help maintain civility, and develop a sense of community. Knowledge of the humanities, they maintain, must be harnessed to science and technology if the latter are to remain creative and humane, just as the humanities need to be informed by science and technology if they are to remain relevant to the human condition. Another analyst, Paul Copperman, has drawn a sobering conclusion. Until now, he has noted:

"Each generation of Americans has outstripped its parents in education, in literacy, and in economic attainment. For the first time in the history of our country, the educational skills of one generation will not surpass, will not equal, will not even approach, those of their parents."

It is important, of course, to recognize that the average citizen today is better educated and more knowledgeable than the average citizen of a generation ago—more literate, and exposed to more mathematics, literature, and science. The positive impact of this fact on the well-being of our country and the lives of our people cannot be overstated. Nevertheless, the average graduate of our schools and colleges today is not as well-educated as the average graduate of 25 or 35 years ago, when a much smaller proportion of our population completed high school and college. The negative impact of this fact likewise cannot be overstated.

Hope and frustration

Statistics and their interpretation by experts show only the surface dimension of the difficulties we face. Beneath them lies a tension between hope and frustration that characterizes current attitudes about education at every level.

We have heard the voices of high school and college students, school board members, and teachers; of leaders of industry, minority groups, and higher education; of parents and State officials. We could hear the hope evident in their commitment to quality education and in their descriptions of outstanding programs and schools. We could also hear the intensity of their frustration, a growing impatience with shoddiness in many walks of American life, and the complaint that this shoddiness is too often reflected in our schools and colleges. Their frustration threatens to overwhelm their hope.

What lies behind this emerging national sense of frustration can be described as both a dimming of personal expectations and the fear of losing a shared vision for America.

On the personal level the student, the parent, and the caring teacher all perceive that a basic promise is not being kept. More and more young people emerge from high school ready neither for college nor for work. This predicament becomes more acute as the knowledge base continues its rapid expansion, the number of traditional jobs shrinks, and new jobs demand greater sophistication and preparation.

On a broader scale, we sense that this undertone of frustration has significant political implications, for it cuts across ages, generations, races, and political and economic groups. We have come to understand that the public will demand that educational and political leaders act forcefully and effectively on these issues. Indeed, such demands have already appeared and could well become a unifying national preoccupation. This unity, however, can be achieved only if we avoid the unproductive tendency of some to search for scapegoats among the victims, such as the beleaguered teachers.

On the positive side is the significant movement by political and educational leaders to search for solutions—so far centering largely on the nearly desperate need for increased support for the teaching of mathematics and science. This movement is but a start on what we believe is a larger and more educationally encompassing need to improve teaching and learning in fields such as English, history, geography, economics, and foreign languages. We believe this movement must be broadened and directed toward reform and excellence throughout education.

Excellence in education

We define "excellence" to mean several related things. At the level of the individual learner, it means performing on the boundary of individual ability in ways that test and push back personal limits, in school and in the workplace. Excellence characterizes a school or college that sets high expectations and goals for all learners, then tries in every way possible to help students reach them. Excellence characterizes a society that has adopted these policies, for it will then be prepared through the education and skill of its people to respond to the challenges of a rapidly changing world. Our Nation's people and its schools and colleges must be committed to achieving excellence in all these areas.

We do not believe that a public commitment to excellence and educational reform must be made at the expense of a strong public commitment to the equitable treatment of our diverse population. The twin goals of equity and high-quality schooling have profound and practical meaning for our economy and society, and we cannot permit one to yield to the other either in principle or in practice. To do so would deny young people their chance to learn and live according to their aspirations and abilities. It also would lead to a generalized accommodation to mediocrity in our society on the one hand or the creation of an undemocratic elitism on the other.

Our goal must be to develop the talents of all to their fullest. Attaining that goal requires that we expect and assist all students to work to the limits of their capabilities. We should expect schools to have genuinely high standards rather than minimum ones, and parents to support and encourage their children to make the most of their talents and abilities.

The search for solutions to our educational problems must also include a commitment to life-long learning. The task of rebuilding our system of learning is enormous and must be properly understood and taken seriously. Although a million and a half new workers enter the economy each year from our schools and colleges, the adults working today will still make up about 75 percent of the workforce in the year 2000. These workers, and new entrants into the workforce, will need further education and retraining if they—and we as a Nation—are to thrive and prosper.

The learning society

In a world of ever-accelerating competition and change in the conditions of the workplace, of ever-greater danger, and of ever-larger opportunities for those prepared to meet them, educational reform should focus on the goal of creating a Learning Society. At the heart of such a society is the commitment to a set of values and to a system of education that affords all members the opportunity to stretch their minds to full capacity, from early childhood through adulthood, learning more as the world itself changes. Such a society has as a basic foundation the idea that education is important not only because of what it contributes to one's career goals but also because of the value it adds to the general quality of one's life. Also at the heart of the Learning Society are educational opportunities extending far beyond the traditional institutions of learning, our schools and colleges. They extend into homes and workplaces, into libraries, art galleries, museums, and science centers, indeed, into every place where the individual can develop and mature in work and life. In our view, formal schooling in youth is the essential foundation for learning throughout one's life. But without life-long learning, one's skills will become rapidly dated.

In contrast to the ideal of the Learning Society, however, we find that for too many people education means doing the minimum work necessary for the moment, then coasting through life on what may have been learned in its first quarter. But this should not surprise us because we tend to express our educational standards and expectations largely in terms of "minimum requirements." And where there should be a coherent continuum of learning, we have none, but instead an often incoherent, outdated patchwork quilt. Many individual, sometimes heroic, examples of schools and colleges of great merit do exist. Our findings and testimony confirm the vitality of a number of notable schools and programs, but their very distinction stands out against a vast mass shaped by tensions and pressures that inhibit systematic academic and vocational achievement for the majority of students. In some metropolitan areas basic literacy has become the goal rather than the starting point. In some colleges maintaining enrollments is of greater day-to-day concern than maintaining rigorous academic standards. And the ideal of academic excellence as the primary goal of schooling seems to be fading across the board in American education.

Thus, we issue this call to all who care about America and its future: to parents and students; to teachers, administrators, and school board members; to colleges and industry; to union members and military leaders; to governors and State legislators; to the President; to members of Congress and other public officials; to members of learned and scientific societies; to the print and electronic media; to concerned citizens everywhere. America is at risk.

We are confident that America can address this risk. If the tasks we set forth are initiated now and our recommendations are fully realized over the next several years, we can expect reform of our Nation's schools, colleges, and universities. This would also reverse the current declining trend—a trend that stems more from weakness of purpose, confusion of vision, underuse of talent, and lack of leadership, than from conditions beyond our control.

The tools at hand

It is our conviction that the essential raw materials needed to reform our educational system are waiting to be mobilized through effective leadership:

The natural abilities of the young that cry out to be developed and the undiminished concern of parents for the well-being of their children;

The commitment of the Nation to high retention rates in schools and colleges and to full access to education for all;

The persistent and authentic American dream that superior performance can raise one's state in life and shape one's own future;

The dedication, against all odds, that keeps teachers serving in schools and colleges, even as the rewards diminish;

Our better understanding of learning and teaching and the implications of this knowledge for school practice, and the numerous examples of local success as a result of superior effort and effective dissemination;

The ingenuity of our policymakers, scientists, State and local educators, and scholars in formulating solutions once problems are better understood;

The traditional belief that paying for education is an investment in ever-renewable human resources that are more durable and flexible than capital plant and equipment, and the availability in this country of sufficient financial means to invest in education;

The equally sound tradition, from the Northwest Ordinance of 1787 until today, that the Federal Government should supplement State, local, and other resources to foster key national educational goals; and

The voluntary efforts of individuals, businesses, and parent and civic groups to cooperate in strengthening educational programs.

These raw materials, combined with the unparalleled array of educational organizations in America, offer us the possibility to create a Learning Society, in which public, private, and parochial schools; colleges and universities; vocational and technical schools and institutes; libraries; science centers, museums, and other cultural institutions; and corporate training and retraining programs offer opportunities and choices for all to learn throughout life.

The public's commitment

Of all the tools at hand, the public's support for education is the most powerful. In a message to a National Academy of Sciences meeting in May 1982, President Reagan commented on this fact when he said:

"This public awareness—and I hope public action—is long overdue. . . . This country was built on American respect for education. . . . Our challenge now is to create a resurgence of that thirst for education that typifies our Nation's history."

The most recent (1982) Gallup Poll of the Public's Attitudes Toward the Public Schools strongly supported a theme heard during our hearings: People are steadfast in their belief that education is the major foundation for the future strength of this country. They even considered education more important than developing the best industrial system or the strongest military force, perhaps because they understood education as the cornerstone of both. They also held that education is "extremely important" to one's future success, and that public education should be the top priority for additional Federal funds. Education occupied first place among 12 funding categories considered in the survey—above health care, welfare, and military defense, with 55 percent selecting public education as one of their first three choices. Very clearly, the public understands the primary importance of education as the foundation for a satisfying life, an enlightened and civil society, a strong economy, and a secure Nation.

At the same time, the public has no patience with undemanding and superfluous high school offerings. In another survey, more than 75 percent of all those questioned believed every student planning to go to college should take 4 years of mathematics, English, history/U.S. government, and science, with more than 50 percent adding 2 years each of a foreign language and economics or business. The public even supports requiring much of this curriculum for students who do not plan to go to college. These standards far exceed the strictest high school graduation requirements of any State today, and they also exceed the admission standards of all but a handful of our most selective colleges and universities.

Another dimension of the public's support offers the prospect of constructive reform. The best term to characterize it may simply be the honorable word "patriotism." Citizens know intuitively what some of the best economists have shown in their research, that education is one of the chief engines of a society's material well-being. They know, too, that education is the common bond of a pluralistic society and helps tie us to other cultures around the globe. Citizens also know in their bones that the safety of the United States depends principally on the wit, skill, and spirit of a self-confident people, today and tomorrow. It is, therefore, essential—especially in a period of long-term decline in educational achievement—for government at all levels to affirm its responsibility for nurturing the Nation's intellectual capital.

And perhaps most important, citizens know and believe that the meaning of America to the rest of the world must be something better than it seems to many today. Americans like to think of this Nation as the preeminent country for generating the great ideas and material benefits for all mankind. The citizen is dismayed at a steady 15-year decline in industrial productivity, as one great American industry after another falls to world competition. The citizen wants the country to act on the belief, expressed in our hearings and by the large majority in the Gallup Poll, that education should be at the top of the Nation's agenda.

Findings

We conclude that declines in educational performance are in large part the result of disturbing inadequacies in the way the educational process itself is often conducted. The findings that follow, culled from a much more extensive list, reflect four important aspects of the educational process: content, expectations, time, and teaching.

Findings Regarding Content

By content we mean the very "stuff" of education, the curriculum. Because of our concern about the curriculum, the Commission examined patterns of courses high school students took in 1964-69 compared with course patterns in 1976-81. On the basis of these analyses we conclude:

Secondary school curricula have been homogenized, diluted, and diffused to the point that they no longer have a central purpose. In effect, we have a cafeteria-style curriculum in which the appetizers and desserts can easily be mistaken for the main courses. Students have migrated from vocational and college preparatory programs to "general track" courses in large numbers. The proportion of students taking a general program of study has increased from 12 percent in 1964 to 42 percent in 1979.

This curricular smorgasbord, combined with extensive student choice, explains a great deal about where we find ourselves today. We offer intermediate algebra, but only 31 percent of our recent high school graduates complete it; we offer French I, but only 13 percent complete it; and we offer geography, but only 16 percent complete it. Calculus is available in schools enrolling about 60 percent of all students, but only 6 percent of all students complete it.

Twenty-five percent of the credits earned by general track high school students are in physical and health education, work experience outside the school, remedial English and mathematics, and personal service and development courses, such as training for adulthood and marriage.

Findings Regarding Expectations

We define expectations in terms of the level of knowledge, abilities, and skills school and college graduates should possess. They also refer to the time, hard work, behavior, self-discipline, and motivation that are essential for high student achievement. Such expectations are expressed to students in several different ways:

By grades, which reflect the degree to which students demonstrate their mastery of subject matter;

Through high school and college graduation requirements, which tell students which subjects are most important;

By the presence or absence of rigorous examinations requiring students to demonstrate their mastery of content and skill before receiving a diploma or a degree;

By college admissions requirements, which reinforce high school standards; and

By the difficulty of the subject matter students confront in their texts and assigned reading.

Our analyses in each of these areas indicate notable deficiencies:

The amount of homework for high school seniors has decreased (two-thirds report less than 1 hour a night) and grades have risen as average student achievement has been declining.

In many other industrialized nations, courses in mathematics (other than arithmetic or general mathematics), biology, chemistry, physics, and geography start in grade 6 and are required of all students. The time spent on these subjects, based on class hours, is about three times that spent by even the most science-oriented U.S. students, i.e., those who select 4 years of science and mathematics in secondary school.

A 1980 State-by-State survey of high school diploma requirements reveals that only eight States require high schools to offer foreign language instruction, but none requires students to take the courses. Thirty-five States require only 1 year of mathematics, and 36 require only 1 year of science for a diploma.

In 13 States, 50 percent or more of the units required for high school graduation may be electives chosen by the student. Given this freedom to choose the substance of half or more of their education, many students opt for less demanding personal service courses, such as bachelor living.

"Minimum competency" examinations (now required in 37 States) fall short of what is needed, as the "minimum" tends to become the "maximum," thus lowering educational standards for all.

One-fifth of all 4-year public colleges in the United States must accept every high school graduate within the State regardless of program followed or grades, thereby serving notice to high school students that they can expect to attend college even if they do not follow a demanding course of study in high school or perform well.

About 23 percent of our more selective colleges and universities reported that their general level of selectivity declined during the 1970s, and 29 percent reported reducing the number of specific high school courses required for admission (usually by dropping foreign language requirements, which are now specified as a condition for admission by only one-fifth of our institutions of higher education).

Too few experienced teachers and scholars are involved in writing textbooks. During the past decade or so a large number of texts have been "written down" by their publishers to ever-lower reading levels in response to perceived market demands.

A recent study by Education Products Information Exchange revealed that a majority of students were able to master 80 percent of the material in some of their subject-matter texts before they had even opened the books. Many books do not challenge the students to whom they are assigned.

Expenditures for textbooks and other instructional materials have declined by 50 percent over the past 17 years. While some recommend a level of spending on texts of between 5 and 10 percent of the operating costs of schools, the budgets for basal texts and related materials have been dropping during the past decade and a half to only 0.7 percent today.

Findings Regarding Time

Evidence presented to the Commission demonstrates three disturbing facts about the use that American schools and students make of time: (1) compared to other nations, American students spend much less time on school work; (2) time spent in the classroom and on homework is often used ineffectively; and (3) schools are not doing enough to help students develop either the study skills required to use time well or the willingness to spend more time on school work.

In England and other industrialized countries, it is not unusual for academic high school students to spend 8 hours a day at school, 220 days per year. In the United States, by contrast, the typical school day lasts 6 hours and the school year is 180 days.

In many schools, the time spent learning how to cook and drive counts as much toward a high school diploma as the time spent studying mathematics, English, chemistry, U.S. history, or biology.

A study of the school week in the United States found that some schools provided students only 17 hours of academic instruction during the week, and the average school provided about 22.

A California study of individual classrooms found that because of poor management of classroom time, some elementary students received only one-fifth of the instruction others received in reading comprehension.

In most schools, the teaching of study skills is haphazard and unplanned. Consequently, many students complete high school and enter college without disciplined and systematic study habits.

Findings Regarding Teaching

The Commission found that not enough of the academically able students are being attracted to teaching; that teacher preparation programs need substantial improvement; that the professional working life of teachers is on the whole unacceptable; and that a serious shortage of teachers exists in key fields.

Too many teachers are being drawn from the bottom quarter of graduating high school and college students.

The teacher preparation curriculum is weighted heavily with courses in "educational methods" at the expense of courses in subjects to be taught. A survey of 1,350 institutions training teachers indicated that 41 percent of the time of elementary school teacher candidates is spent in education courses, which reduces the amount of time available for subject matter courses.

The average salary after 12 years of teaching is only $17,000 per year, and many teachers are required to supplement their income with part-time and summer employment. In addition, individual teachers have little influence in such critical professional decisions as, for example, textbook selection.

Despite widespread publicity about an overpopulation of teachers, severe shortages of certain kinds of teachers exist: in the fields of mathematics, science, and foreign languages; and among specialists in education for gifted and talented, language minority, and handicapped students.

The shortage of teachers in mathematics and science is particularly severe. A 1981 survey of 45 States revealed shortages of mathematics teachers in 43 States, critical shortages of earth sciences teachers in 33 States, and of physics teachers everywhere.

Half of the newly employed mathematics, science, and English teachers are not qualified to teach these subjects; fewer than one-third of U.S. high schools offer physics taught by qualified teachers.

Recommendations

In light of the urgent need for improvement, both immediate and long term, this Commission has agreed on a set of recommendations that the American people can begin to act on now, that can be implemented over the next several years, and that promise lasting reform. The topics are familiar; there is little mystery about what we believe must be done. Many schools, districts, and States are already giving serious and constructive attention to these matters, even though their plans may differ from our recommendations in some details.

We wish to note that we refer to public, private, and parochial schools and colleges alike. All are valuable national resources. Examples of actions similar to those recommended below can be found in each of them.

We must emphasize that the variety of student aspirations, abilities, and preparation requires that appropriate content be available to satisfy diverse needs. Attention must be directed to both the nature of the content available and to the needs of particular learners. The most gifted students, for example, may need a curriculum enriched and accelerated beyond even the needs of other students of high ability. Similarly, educationally disadvantaged students may require special curriculum materials, smaller classes, or individual tutoring to help them master the material presented. Nevertheless, there remains a common expectation: We must demand the best effort and performance from all students, whether they are gifted or less able, affluent or disadvantaged, whether destined for college, the farm, or industry.

Our recommendations are based on the beliefs that everyone can learn, that everyone is born with an urge to learn which can be nurtured, that a solid high school education is within the reach of virtually all, and that life-long learning will equip people with the skills required for new careers and for citizenship.

Recommendation A: Content

We recommend that State and local high school graduation requirements be strengthened and that, at a minimum, all students seeking a diploma be required to lay the foundations in the Five New Basics by taking the following curriculum during their 4 years of high school: (a) 4 years of English; (b) 3 years of mathematics; (c) 3 years of science; (d) 3 years of social studies; and (e) one-half year of computer science. For the college-bound, 2 years of foreign language in high school are strongly recommended in addition to those taken earlier.

Whatever the student's educational or work objectives, knowledge of the New Basics is the foundation of success for the after-school years and, therefore, forms the core of the modern curriculum. A high level of shared education in these Basics, together with work in the fine and performing arts and foreign languages, constitutes the mind and spirit of our culture. The following Implementing Recommendations are intended as illustrative descriptions. They are included here to clarify what we mean by the essentials of a strong curriculum.

Implementing Recommendations

1. The teaching of English in high school should equip graduates to: (a) comprehend, interpret, evaluate, and use what they read; (b) write well-organized, effective papers; (c) listen effectively and discuss ideas intelligently; and (d) know our literary heritage and how it enhances imagination and ethical understanding, and how it relates to the customs, ideas, and values of today's life and culture.

2. The teaching of mathematics in high school should equip graduates to: (a) understand geometric and algebraic concepts; (b) understand elementary probability and statistics; (c) apply mathematics in everyday situations; and (d) estimate, approximate, measure, and test the accuracy of their calculations. In addition to the traditional sequence of studies available for college-bound students, new, equally demanding mathematics curricula need to be developed for those who do not plan to continue their formal education immediately.

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3. The teaching of science in high school should provide graduates with an introduction to: (a) the concepts, laws, and processes of the physical and biological sciences; (b) the methods of scientific inquiry and reasoning; (c) the application of scientific knowledge to everyday life; and (d) the social and environmental implications of scientific and technological development. Science courses must be revised and updated for both the college-bound and those not intending to go to college. An example of such work is the American Chemical Society's "Chemistry in the Community" program.

4. The teaching of social studies in high school should be designed to: (a) enable students to fix their places and possibilities within the larger social and cultural structure; (b) understand the broad sweep of both ancient and contemporary ideas that have shaped our world; and (c) understand the fundamentals of how our economic system works and how our political system functions; and (d) grasp the difference between free and repressive societies. An understanding of each of these areas is requisite to the informed and committed exercise of citizenship in our free society.

5. The teaching of computer science in high school should equip graduates to: (a) understand the computer as an information, computation, and communication device; (b) use the computer in the study of the other Basics and for personal and work-related purposes; and (c) understand the world of computers, electronics, and related technologies.

In addition to the new Basics, other important curriculum matters must be addressed.

6. Achieving proficiency in a foreign language ordinarily requires from 4 to 6 years of study and should, therefore, be started in the elementary grades. We believe it is desirable that students achieve such proficiency because study of a foreign language introduces students to non-English-speaking cultures, heightens awareness and comprehension of one's native tongue, and serves the Nation's needs in commerce, diplomacy, defense, and education.

7. The high school curriculum should also provide students with programs requiring rigorous effort in subjects that advance students' personal, educational, and occupational goals, such as the fine and performing arts and vocational education. These areas complement the New Basics, and they should demand the same level of performance as the Basics.

8. The curriculum in the crucial eight grades leading to the high school years should be specifically designed to provide a sound base for study in those and later years in such areas as English language development and writing, computational and problem solving skills, science, social studies, foreign language, and the arts. These years should foster an enthusiasm for learning and the development of the individual's gifts and talents.

9. We encourage the continuation of efforts by groups such as the American Chemical Society, the American Association for the Advancement of Science, the Modern Language Association, and the National Councils of Teachers of English and Teachers of Mathematics, to revise, update, improve, and make available new and more diverse curricular materials. We applaud the consortia of educators and scientific, industrial, and scholarly societies that cooperate to improve the school curriculum.

Recommendation B: Standards and expectations

We recommend that schools, colleges, and universities adopt more rigorous and measurable standards, and higher expectations, for academic performance and student conduct, and that 4-year colleges and universities raise their requirements for admission. This will help students do their best educationally with challenging materials in an environment that supports learning and authentic accomplishment.

Implementing Recommendations

1. Grades should be indicators of academic achievement so they can be relied on as evidence of a student's readiness for further study.

2. Four-year colleges and universities should raise their admissions requirements and advise all potential applicants of the standards for admission in terms of specific courses required, performance in these areas, and levels of achievement on standardized achievement tests in each of the five Basics and, where applicable, foreign languages.

3. Standardized tests of achievement (not to be confused with aptitude tests) should be administered at major transition points from one level of schooling to another and particularly from high school to college or work. The purposes of these tests would be to: (a) certify the student's credentials; (b) identify the need for remedial intervention; and (c) identify the opportunity for advanced or accelerated work. The tests should be administered as part of a nationwide (but not Federal) system of State and local standardized tests. This system should include other diagnostic procedures that assist teachers and students to evaluate student progress.

4. Textbooks and other tools of learning and teaching should be upgraded and updated to assure more rigorous content. We call upon university scientists, scholars, and members of professional societies, in collaboration with master teachers, to help in this task, as they did in the post-Sputnik era. They should assist willing publishers in developing the products or publish their own alternatives where there are persistent inadequacies.

5. In considering textbooks for adoption, States and school districts should: (a) evaluate texts and other materials on their ability to present rigorous and challenging material clearly; and (b) require publishers to furnish evaluation data on the material's effectiveness.

6. Because no textbook in any subject can be geared to the needs of all students, funds should be made available to support text development in "thin-market" areas, such as those for disadvantaged students, the learning disabled, and the gifted and talented.

7. To assure quality, all publishers should furnish evidence of the quality and appropriateness of textbooks, based on results from field trials and credible evaluations. In view of the enormous numbers and varieties of texts available, more widespread consumer information services for purchasers are badly needed.

8. New instructional materials should reflect the most current applications of technology in appropriate curriculum areas, the best scholarship in each discipline, and research in learning and teaching.

Recommendation C: Time

We recommend that significantly more time be devoted to learning the New Basics. This will require more effective use of the existing school day, a longer school day, or a lengthened school year.

Implementing Recommendations

1. Students in high schools should be assigned far more homework than is now the case.

2. Instruction in effective study and work skills, which are essential if school and independent time is to be used efficiently, should be introduced in the early grades and continued throughout the student's schooling.

3. School districts and State legislatures should strongly consider 7-hour school days, as well as a 200- to 220-day school year.

4. The time available for learning should be expanded through better classroom management and organization of the school day. If necessary, additional time should be found to meet the special needs of slow learners, the gifted, and others who need more instructional diversity than can be accommodated during a conventional school day or school year.

5. The burden on teachers for maintaining discipline should be reduced through the development of firm and fair codes of student conduct that are enforced consistently, and by considering alternative classrooms, programs, and schools to meet the needs of continually disruptive students.

6. Attendance policies with clear incentives and sanctions should be used to reduce the amount of time lost through student absenteeism and tardiness.

7. Administrative burdens on the teacher and related intrusions into the school day should be reduced to add time for teaching and learning.

8. Placement and grouping of students, as well as promotion and graduation policies, should be guided by the academic progress of students and their instructional needs, rather than by rigid adherence to age.

Recommendation D: Teaching

This recommendation consists of seven parts. Each is intended to improve the preparation of teachers or to make teaching a more rewarding and respected profession. Each of the seven stands on its own and should not be considered solely as an implementing recommendation.

1. Persons preparing to teach should be required to meet high educational standards, to demonstrate an aptitude for teaching, and to demonstrate competence in an academic discipline. Colleges and universities offering teacher preparation programs should be judged by how well their graduates meet these criteria.

2. Salaries for the teaching profession should be increased and should be professionally competitive, market-sensitive, and performance-based. Salary, promotion, tenure, and retention decisions should be tied to an effective evaluation system that includes peer review so that superior teachers can be rewarded, average ones encouraged, and poor ones either improved or terminated.

3. School boards adopt an 11-month contract for teachers. This would ensure time for curriculum and professional development, programs for students with special needs, and a more adequate level of teacher compensation.

4. School boards, administrators, and teachers should cooperate to develop career ladders for teachers that distinguish among the beginning instructor, the experienced teacher, and the master teacher.

5. Substantial nonschool personnel resources should be employed to help solve the immediate problem of the shortage of mathematics and science teachers. qualified individuals including recent graduates with mathematics and science degrees, graduate students, and industrial and retired scientists could, with appropriate preparation, immediately begin teaching in these fields. A number of our leading science centers have the capacity to begin educating and retraining teachers immediately. Other areas

of critical teacher need, such as English, must also be addressed.

6. Incentives, such as grants and loans, should be made available to attract outstanding students to the teaching profession, particularly in those areas of critical shortage.

7. Master teachers should be involved in designing teacher preparation programs and in supervising teachers during their probationary years.

Recommendation E: Leadership and fiscal support

We recommend that citizens across the Nation hold educators and elected officials responsible for providing the leadership necessary to achieve these reforms, and that citizens provide the fiscal support and stability required to bring about the reforms we propose.

Implementing Recommendations

1. Principals and superintendents must play a crucial leadership role in developing school and community support for the reforms we propose, and school boards must provide them with the professional development and other support required to carry out their leadership role effectively. The Commission stresses the distinction between leadership skills involving persuasion, setting goals and developing community consensus behind them, and managerial and supervisory skills. Although the latter are necessary, we believe that school boards must consciously develop leadership skills at the school and district levels if the reforms we propose are to be achieved.

2. State and local officials, including school board members, governors, and legislators, have the primary responsibility for financing and governing the schools, and should incorporate the reforms we propose in their educational policies and fiscal planning.

3. The Federal Government, in cooperation with States and localities, should help meet the needs of key groups of students such as the gifted and talented, the socioeconomically disadvantaged, minority and language minority students, and the handicapped. In combination these groups include both national resources and the Nation's youth who are most at risk.

4. In addition, we believe the Federal Government's role includes several functions of national consequence that States and localities alone are unlikely to be able to meet: protecting constitutional and civil rights for students and school personnel; collecting data, statistics, and information about education generally; supporting curriculum improvement and research on teaching, learning, and the management of schools; supporting teacher training in areas of critical shortage or key national needs; and providing student financial assistance and research and graduate training. We believe the assistance of the Federal Government should be provided with a minimum of administrative burden and intrusiveness.

5. The Federal Government has the primary responsibility to identify the national interest in education. It should also help fund and support efforts to protect and promote that interest. It must provide the national leadership to ensure that the Nation's public and private resources are marshaled to address the issues discussed in this report.

6. This Commission calls upon educators, parents, and public officials at all levels to assist in bringing about the educational reform proposed in this report. We also call upon citizens to provide the financial support necessary to accomplish these purposes. Excellence costs. But in the long run mediocrity costs far more.

America can do it

Despite the obstacles and difficulties that inhibit the pursuit of superior educational attainment, we are confident, with history as our guide, that we can meet our goal. The American educational system has responded to previous challenges with remarkable success. In the 19th century our land-grant colleges and universities provided the research and training that developed our Nation's natural resources and the rich agricultural bounty of the American farm. From the late 1800s through mid-20th century, American schools provided the educated workforce needed to seal the success of the Industrial Revolution and to provide the margin of victory in two world wars. In the early part of this century and continuing to this very day, our schools have absorbed vast waves of immigrants and educated them and their children to productive citizenship. Similarly, the Nation's Black colleges have provided opportunity and undergraduate education to the vast majority of college-educated Black Americans.

More recently, our institutions of higher education have provided the scientists and skilled technicians who helped us transcend the boundaries of our planet. In the last 30 years, the schools have been a major vehicle for expanded social opportunity, and now graduate 75 percent of our young people from high school. Indeed, the proportion of Americans of college age enrolled in higher education is nearly twice that of Japan and far exceeds other nations such as France, West Germany, and the Soviet Union. Moreover, when international comparisons were last made a decade ago, the top 9 percent of American students compared favorably in achievement with their peers in other countries.

In addition, many large urban areas in recent years report that average student achievement in elementary schools is improving. More and more schools are also offering advanced placement programs and programs for gifted and talented students, and more and more students are enrolling in them.

We are the inheritors of a past that gives us every reason to believe that we will succeed.

A word to parents and students

The task of assuring the success of our recommendations does not fall to the schools and colleges alone. Obviously, faculty members and administrators, along with policymakers and the mass media, will play a crucial role in the reform of the educational system. But even more important is the role of parents and students, and to them we speak directly.

To Parents

You know that you cannot confidently launch your children into today's world unless they are of strong character and well-educated in the use of language, science, and mathematics. They must possess a deep respect for intelligence, achievement, and learning, and the skills needed to use them; for setting goals; and for disciplined work. That respect must be accompanied by an intolerance for the shoddy and second-rate masquerading as "good enough."

You have the right to demand for your children the best our schools and colleges can provide. Your vigilance and your refusal to be satisfied with less than the best are the imperative first step. But your right to a proper education for your children carries a double responsibility. As surely as you are your child's first and most influential teacher, your child's ideas about education and its significance begin with you. You must be a living example of what you expect your children to honor and to emulate. Moreover, you bear a responsibility to participate actively in your child's education. You should encourage more diligent study and discourage satisfaction with mediocrity and the attitude that says "let it slide"; monitor your child's study; encourage good study habits; encourage your child to take more demanding rather than less demanding courses; nurture your child's curiosity, creativity, and confidence; and be an active participant in the work of the schools. Above all, exhibit a commitment to continued learning in your own life. Finally, help your children understand that excellence in education cannot be achieved without intellectual and moral integrity coupled with hard work and commitment. Children will look to their parents and teachers as models of such virtues.

To Students

You forfeit your chance for life at its fullest when you withhold your best effort in learning. When you give only the minimum to learning, you receive only the minimum in return. Even with your parents' best example and your teachers' best efforts, in the end it is your work that determines how much and how well you learn. When you work to your full capacity, you can hope to attain the knowledge and skills that will enable you to create your future and control your destiny. If you do not, you will have your future thrust upon you by others. Take hold of your life, apply your gifts and talents, work with dedication and self-discipline. Have high expectations for yourself and convert every challenge into an opportunity.

A Final Word

This is not the first or only commission on education, and some of our findings are surely not new, but old business that now at last must be done. For no one can doubt that the United States is under challenge from many quarters.

Children born today can expect to graduate from high school in the year 2000. We dedicate our report not only to these children, but also to those now in school and others to come. We firmly believe that a movement of America's schools in the direction called for by our recommendations will prepare these children for far more effective lives in a far stronger America.

Our final word, perhaps better characterized as a plea, is that all segments of our population give attention to the implementation of our recommendations. Our present plight did not appear overnight, and the responsibility for our current situation is widespread. Reform of our educational system will take time and unwavering commitment. It will require equally widespread, energetic, and dedicated action. For example, we call upon the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, Science Service, National Science Foundation, Social Science Research Council, American Council of Learned Societies, National Endowment for the Humanities, National Endowment for the Arts, and other scholarly, scientific, and learned societies for their help in this effort. Help should come from students themselves; from parents, teachers, and school boards; from colleges and universities; from local, State, and Federal officials; from teachers' and administrators' organizations; from industrial and labor councils; and from other groups with interest in and responsibility for educational reform.

It is their America, and the America of all of us, that is at risk; it is to each of us that this imperative is addressed. It is by our willingness to take up the challenge, and

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our resolve to see it through, that America's place in the world will be either secured or forfeited. Americans have succeeded before and so we shall again.

APPENDIXES

Appendix A: Charter National Commission on Excellence in Education

Authority

20 U.S.C. 1233a. The Commission is governed by the provisions of Part D of the General Education Provisions Act (P.L. 90-247 as amended; 20 U.S.C. 1233 et seq.) and the Federal Advisory Committee Act (P.L. 92-463; 5 U.S.C. Appendix I) which set forth standards for the formation and use of advisory committees.

Purpose and Functions

The Commission advises and makes recommendations to the nation and to the Secretary of Education. To carry out his mission the Commission is charged with the following responsibilities:

(1) To review and synthesize the data and scholarly literature on the quality of learning and teaching in the nation's schools, colleges, and universities, both public and private, with special concern for the educational experience of teen-age youth;

(2) To examine and to compare and contrast the curricula, standards, and expectations of the educational systems of several advanced countries with those of the United States;

(3) To study a representative sampling of university and college admission standards and lower division course requirements with particular reference to the impact upon the enhancement of quality and the promotion of excellence such standards may have on high school curricula and on expected levels of high school academic achievement;

(4) To review and to describe educational programs that are recognized as preparing students who consistently attain higher than average scores in college entrance examinations and who meet with unusual success the demands placed on them by the nation's colleges and universities;

(5) To review the major changes that have occurred in American education as well as events in society during the past quarter century that have significantly affected educational achievement;

(6) To hold hearings and to receive testimony and expert advice on efforts that could and should be taken to foster higher levels of quality and academic excellence in the nation's schools, colleges, and universities;

(7) To do all other things needed to define the problems of and the barriers to attaining greater levels of excellence in American education; and

(8) To report and to make practical recommendations for action to be taken by educators, public officials, governing boards, parents, and others having a vital interest in American education and a capacity to influence it for the better.

Structure

The Commission consists of at least 12, but not more than 18, public members appointed by the Secretary. The Secretary shall designate a chairperson from among the members. Among its members the Commission includes persons who are knowledgeable about educational programs at various levels and are familiar with views of the public, of employers, of educators, and of leaders of a range of professions regarding the status of education today, requirements for the future, and ways the quality of education for all Americans can be improved.

A quorum of the Commission is a majority of appointed members.

Terms of service of members end with the termination of the Commission.

Hearings on behalf of the Commission may be held by one or more members with the authorization of the chairperson.

The Commission may establish standing committees composed exclusively of its members. Each standing committee complies with the requirements of applicable statutes and Departmental regulations. Each committee presents to the Commission findings and recommendations for action by the full Commission. Timely notification of the establishment of a committee and any change therein, including its charge, membership, and frequency of meetings, will be made in writing to the Committee Management Officer. All committees act under the policies established by the Commission as a whole.

Management and staff services are provided by the Executive Director who serves as the Designated Federal Official to the Commission and by the National Institute of Education.

Meetings

The Commission meets approximately four times a year at the call of the Chairperson with the advance approval of the Secretary or the Designated Federal Official who approves the agenda and is present or represented at all meetings. Standing committees meet as required at the call of their Chairperson with the concurrence of the Commission Chairperson. All meetings are open to the public except as determined otherwise by the Assistant Secretary for Educational Research and Improvement. Notice of all meetings shall be given to the public. Meetings are conducted, and records of proceedings kept, in accordance with applicable laws and Department regulations.

Compensation

In accordance with the General Education Provisions Act and other applicable laws, Commission members shall be entitled to an honorarium of $100 per day for official business of the Commission. Their per diem and travel expenses will be paid in accordance with Federal Travel Regulations.

Annual Cost Estimate

Estimate of the direct cost for operating the Commission, including compensation and travel expenses for members as well as costs for studies, but excluding staff support, is [illegible]. Estimate of annual person years of staff required is 10. Estimate of direct annual costs for administrative support, staff and staff per diem and travel expenses is [illegible]. The National Institute of Education will provide additional administrative and research assistance to the Commission.

Reports

In addition to its final report, which is expected eighteen months from the initial meeting, the Commission submits to the Congress by March 31 of each year an annual report which contains as a minimum a list of the names and business addresses of the members, a list of the dates and places of the meetings, the functions of the Commission, and a summary of Commission activities and recommendations made during the year. Such report is transmitted with the Secretary's annual report to Congress. The Commission makes such other reports or recommendations as may be appropriate. A copy of the annual report and other reports is provided to the Committee Management Officer.

Termination Date

It is estimated that the time necessary for the Commission to complete its activities and report is at least 18 months. Therefore, to insure the completion of the report, the Secretary determines that this Commission terminates not later than two years from the date of this Charter.

Approved: August 5, 1981.

T. H. Bell,
Secretary.

Appendix B: Schedule of the Commission's public events

Event, Date(s), Place, and Host(s)

Full Commission Meeting: October 9-10, 1981; Washington, D.C.

Full Commission Meeting: December 7, 1981; Washington, D.C.

Full Commission Meeting: February 25, 1982; Washington, D.C.

Hearing—Science, Mathematics, and Technology Education: March 11, 1982; Stanford University, Stanford, California; Donald Kennedy, President, Stanford University; J. Myron Atkin, Dean, Graduate School of Education, Stanford University.

Hearing—Language and Literacy: Skills for Academic Learning: April 16, 1982; Houston Independent School District, Houston, Texas; Raymon Bynum, Texas State Commissioner of Education; Billy R. Reagan, General Superintendent, Houston Independent School District.

Panel Discussion—Performance Expectations in American Education: April 30, 1982; The University of Pennsylvania, Philadelphia, Pennsylvania; Thomas Ehrlich, Provost The University of Pennsylvania.

Hearing—Teaching and Teacher Education: May 12, 1982; Georgia State University, Atlanta, Georgia; Alonzo Crim, Superintendent, Atlanta Public Schools; Sherman Day, Dean, School of Education, Georgia State University; Barbara Hatton, Dean, School of Education, Atlanta University.

In addition to these public events, the Commission members also attended a number of subcommittee meetings and work sessions over the course of 18 months.

Full Commission Meeting: May 25, 1982; Washington, D.C.

Hearing—College Admissions and the Transition to Post-Secondary Education: June 23, 1982; Roosevelt University, Chicago, Illinois; Rolf Weil, President, Roosevelt University; John Corbally, President, John D. and Catherine T. MacArthur Foundation, Chicago.

Symposium—The Student's Role in Learning: July 30, 1982; San Diego State University, California; Thomas Day, President, San Diego State University; Richard Atkinson, Chancellor, University of California, San Diego.

Panel Discussion—College Curriculum: Shape, Influence, and Assessment: August 27, 1982; University of Rhode Island; Kingston, Rhode Island; Frank Newman, President; University of Rhode Island.

Hearing—Education for a Productive Role in a Productive Society: September 16, 1982; St. Cajetan's Center, Denver, Colorado; Robert Andringa, Executive Director, Education Commission of the States, Denver.

Full Commission Meeting: September 28-29, 1982; New York, New York; Robert Payton, President, Exxon Education Foundation, Exxon Corporation, New York, New York.

Hearing—Education for the Gifted and Talented: October 15, 1982; Harvard University, Cambridge, Massachusetts; Derek Bok, President, Harvard University; Patricia Albjerg Graham, Dean, Harvard Graduate School of Education.

Full Commission Meeting: November 13-15, 1982; Washington, D.C.

Full Commission Meeting: January 21-23, 1983; Washington, D.C.

Full Commission Meeting: April 26, 1983 Washington, D.C.

Appendix C: Commissioned papers

Author(s) and Paper:

Joseph Adelson, The University of Michigan, Ann Arbor: "Twenty-Five Years of American Education: An Interpretation."

Catherine P. Ailes, Francis W. Rushing, SRI International, Arlington, Virginia: "A Summary Report on the Educational Systems of the United States and the Soviet Union: Comparative Analysis."

Alexander W. Astin, University of California, Los Angeles: "Excellence and Equity in American Education."

Alexander W. Astin, University of California, Los Angeles: "The American Freshman, 1966-1981: Some Implications for Educational Policy and Practice."

Herman Blake, University of California, Santa Cruz: "Demographic Change and Curriculum: New Students in Higher Education."

Richard I. Brod, the Modern Language Association, New York, New York; Nicholas Farnham, The International Council on the Future of the University, New York, New York; William V. Mayer, Biological Sciences Curriculum Study, Boulder, Colorado; Robert A. McCaughey, Barnard College, New York, New York: "University Entrance Examinations and Performance Expectations."

Barbara B. Burn, Christopher H. Hurn, University of Massachusetts, Amherst: "An Analytic Comparison of Educational Systems."

Philip Cusick, Michigan State University, East Lansing: "Secondary Public Schools in America."

Paul DeHart Hurd, Stanford University, California: "An Overview of Science Education in the United States and Selected Foreign Countries."

Walter Doyle, University of Texas at Austin: "Academic Work."

Kenneth Duckworth, University of Oregon, Eugene: "Some Ideas About Student Cognition, Motivation and Work" (A Critique of the Symposium on *The Student's Role in Learning*).

Max A. Eckstein, Queens College/City of New York, Flushing; Susanne Shafer, Arizona State University, Tempe; Kenneth Travers, University of Illinois, Champaign-Urbana: "A Comparative Review of Curriculum: Mathematics and International Studies in the Secondary Schools of Five Countries."

Eleanor Farrar, The Huron Institute, Cambridge, Massachusetts; Matthew B. Miles, Center for Policy Research, New York, New York; Barbara Neufeld, The Huron Institute, Cambridge, Massachusetts: "A Review of Effective Schools Research: Implications for Practice and Research."

Zelda Gamson, University of Michigan, Ann Arbor: "A Little Light on the Subject: Keeping General and Liberal Education Alive."

William E. Gardner, University of Minnesota, Minneapolis; John R. Palmer, University of Wisconsin, Madison: "Certification and Accreditation: Background, Issue Analysis, and Recommendations."

Thomas L. Good, University of Missouri-Columbia: "What is Learned in Schools: Responding to School Demands, Grades K-6."

Thomas L. Good and Gail M. Hinkel, University of Missouri-Columbia: "Schooling in America: Some Descriptive and Explanatory Statements."

Donald B. Holsinger, State University of New York, Albany: "Time, Content and Expectations as Predictors of School Achievement in the U.S.A. and Other Developed Countries: A Review of IEA Evidence."

Kenneth R. Howey, University of Minnesota, Minneapolis: "Charting Directions for Preservice Teacher Education."

Torsten Husen, University of Stockholm, Sweden: "A Cross-National Perspective on Assessing the Quality of Learning."

Nancy Karweit, Johns Hopkins University, Baltimore, Maryland: "Time on Task: A Research Review."

Howard London, Bridgewater State College, Massachusetts: "Academic Standards in the American Community College: Trends and Controversies."

Martin L. Maehr, University of Illinois, Champaign-Urbana: "Motivational Factors in School Achievement."

Matthew B. Miles, Center for Policy Research, New York, New York; Eleanor Farrar and Barbara Neufeld, The Huron Institute, Cambridge, Massachusetts: "The Extent of Adoption of Effective Schools Programs."

Barbara Neufeld and Eleanor Farrar, The Huron Institute, Cambridge, Massachusetts; Matthew B. Miles, Center for Policy Research, New York, New York: "A Review of Effective Schools Research: The Message for Secondary Schools."

William Neumann, Syracuse University, New York: "College Press and Student Fit."

C. Robert Pace, University of California, Los Angeles: "Achievement and Quality of Student Effort."

Harvey L. Prokop, San Diego Unified School District, California: "Intelligence, Motivation and the Quantity and Quality of Academic Work and their Impacts on the Learning of Students: A Practitioner's Reaction" (A Critique of the Symposium on *The Student's Role in Learning*).

Lauren B. Resnick, University of Pittsburgh, Pennsylvania; Daniel P. Resnick, Carnegie-Mellon University, Pittsburgh, Pennsylvania: "Standards, Curriculum, and Performance: An Historical and Comparative Perspective."

Frederick Rudolph, Williams College, Williamstown, Massachusetts: "Educational Excellence—The Secondary School-College Connection and Other Matters: An Historical Assessment."

Clifford Sjogren, University of Michigan, Ann Arbor: "College Admissions and the Transition to Postsecondary Education: Standards and Practices."

Richard E. Snow, Stanford University, California: "Intelligence, Motivation and Academic Work" (A Critique of the Symposium on *The Student's Role in Learning*).

Robert J. Sternberg and Richard Wagner, Yale University, New Haven, Connecticut: "Understanding Intelligence: What's in It for Educators?"

Deborah Stipek, University of California, Los Angeles: "Motivating Students to Learn: A Lifelong Perspective."

Judith Torney-Purta, University of Maryland, College Park; John Schwille, Michigan State University, East Lansing: "The Values Learned in School: Policy and Practice in Industrialized Countries."

Beatrice Ward, John R. Mergendoller, and Alexis L. Mitman, Far West Laboratory of Educational Research and Development, San Francisco, California: "The Years Between Elementary School and High School: What Schooling Experiences Do Students Have?"

Jonathan Warren, Educational Testing Service, Berkeley, California: "The Faculty Role in Educational Excellence."

Dean K. Whitla, Harvard University, Cambridge, Massachusetts: "Value Added and Other Related Matters."

Sam J. Yarger, Syracuse University, New York: "Inservice Education."

Herbert Zimiles, Bank Street College of Education, New York, New York: "The Changing American Child: The Perspective of Educators."

Commissioned papers will be available in the ERIC system after July 1983 (See Ordering Information).

Also available through the ERIC system after July 1983:

Clifford Adelman, National Institute of Education, Washington, D.C.: "A Study of High School Transcripts, 1964-1981."

Appendix D: Hearing testimony

Science, mathematics, and technology education

H. Guyford Stever, National Academy of Sciences, Washington, D.C.

Bernard M. Oliver, Hewlett-Packard Company, Palo Alto, California.

Henry L. Alder, University of California, Davis, representing the Council of Scientific Society Presidents.

Sarah E. Klein, Roton Middle School, Norwalk, Connecticut, representing the National Science Teachers Association.

Harold D. Taylor, Hillsdale High School, San Mateo, California, representing the National Council of Teachers of Mathematics.

John Martin, Palo Alto Unified School District, California.

Ruth Willis, Hamilton Junior High School, Oakland, California.

Sam Dederian, San Francisco Unified School District, California.

Leroy Finkel, San Mateo County Office of Education, California.

Olivia Martinez, San Jose Unified School District, California.

Robert Ball, General Electric Company, San Jose, California.

Judith Hutner, representing the Governor's Office, State of California.

Robert W. Walker, De Anza-Foothill Community College District, California.

Nancy Kreinberg, Lawrence Hall of Science, Berkeley, California.

Robert Finnell, Lawrence Hall of Science, Berkeley, California.

Marian E. Koshland, University of California, Berkeley, representing the National Science Board.

Alan M. Portis, University of California, Berkeley, representing the Education Committee of the American Physical Society.

Leon Henkin, University of California, Berkeley, representing the U.S. Commission on Mathematical Instruction.

John Pearson, Edison High School, Huntington Beach, California.

Alan Fibish, Lowell High School, San Francisco, California.

Juliet E. Henry, representing the California Teachers Association.

Jose Bravo, Board of Education, Los Angeles, California.

Frank Oppenheimer, Exploratorium, San Francisco, California.

Leigh Burstein, University of California, Los Angeles.

Judy Chamberlain, Cupertino Unified School District, California.

Michael Summerville, Fremont Unified High School District, California.

Ted Perry, San Jose Unified School District, California.

Paul DeHart Hurd, Stanford University, California.

Elizabeth Karplus, Campolindo High School, Moraga, California.

Louis Fein, Palo Alto Learners Association, California.

Bob McFarland, representing the California Math Council.

Katherine Burt, Cupertino Elementary School District, California.

Lee Rush, California Engineering Foundation.

Gordon M. Ambach, State Education Department, Albany, New York.

James L. Casey, State Department of Education, Oklahoma City, Oklahoma.

Carolyn Graham, Jefferson Elementary School, Burbank, California.

Marcy Holtom, Ambler, Pennsylvania.

Howard C. Mel and Kay Fairwell, Lawrence Hall of Science, Berkeley, California.

Jean Phillips, Thousand Oaks, California.

Simon Ramo, the TRW-Fujitsu Company, Redondo Beach, California.

Gerhardt W. Reidel, University of West Los Angeles, Culver City, California.

Carl L. Riehm, Virginia State Department of Education, Richmond, Virginia.

John H. Saxon, Norman, Oklahoma.

Thomas O. Sidebottom, Interactive Sciences, Inc., Palo Alto, California.

Karl Weiss, Northeastern University, Boston, Massachusetts.

Jan West, Oroville, California.

Related activities in the Bay Area

Site Visit: Lawrence Hall of Science, University of California, Berkeley, Howard C. Mel, Director.

Tour of the Paul and Jean Hanna Collection on the Role of Education and the Archives and Library at the Hoover Institution, Stanford University.

Dinner with business, education, and community leaders, Sponsored by the Chamber of Commerce of the United States, Western Regional Office, and the William and Flora Hewlett Foundation.

Language and literacy: Skills for academic learning

Richard C. Anderson, University of Illinois, Champaign-Urbana.

Margaret Smith-Burke, New York University, New York.

Donald Graves, University of New Hampshire, Durham.

Eileen Lundy, University of Texas, San Antonio.

Ray Clifford, Defense Language Institute, Presidio of Monterey, California.

Lily Wong-Fillmore, University of California, Berkeley.

Victoria Bergin, Texas Education Agency, Austin.

Alan C. Purves, University of Illinois, Champaign-Urbana.

Delia Pompa, Houston Independent School District, Texas.

Olivia Munoz, Houston Independent School District, Texas.

James Kinneavy, University of Texas, Austin.

Betty Von Maszewski, Deer Park Independent School District, Texas.

Claire E. Weinstein, University of Texas, Austin.

Patricia Sturdivant, Houston Independent School District, Texas.

June Dempsey, University of Houston, Texas, representing the American Association of Community and Junior Colleges, the Western College Reading Association, and the National Association for Remedial and Developmental Studies in Postsecondary Education.

Jane Porter, College Board, Austin, Texas.

Kay Bell, Texas Classroom Teachers Association, Austin, Texas.

Judy Walker de Felix, University of Houston, Texas.

Barbara Glave, University of Houston, Texas, representing the Houston Area Teachers of Foreign Language.

Dora Scott, Houston Independent School District, Texas, representing the National Education Association and the Texas State Teachers Association, Houston.

Georgette Sellins, Spring Independent School District, Texas.

Renata Donovan, Spring Branch Independent School District, Texas.

Gordon M. Ambach, State Education Department, Albany, New York.

Jo Bennett and Jean Parochetti, Alvin Community College, Texas.

Sharon Robinson, National Education Association, Washington, D.C.

Donald L. Rubin, University of Georgia, Athens, representing the Speech Communication Association.

Robert H. Schwartz, University of Houston, Texas.

Ralph C. Staiger, International Reading Association, Newark, Delaware.

Helen Warringer-Burke and Carl L. Riehm, Department of Education, Richmond, Virginia.

William Work, Speech Communication Association, Annandale, Virginia.

Daryl R. Yost, East Allen County Schools, New Haven, Indiana.

Related activities in Houston

Site visits coordinated by the Office of the General Superintendent of the Houston Independent School District: Briargrove Elementary School, Wilson Elementary School, Clifton Middle School, Bellaire High School, High School for Engineering Professions, High School for Health Professions, High School for Performing and Visual Arts.

Teaching and Teacher Education

Gary Sykes, National Institute of Education, Washington, D.C.

Gary Fenstermacher, Virginia Polytechnic Institute and State University, Blacksburg.

David G. Imig, American Association of Colleges for Teacher Education, Washington, D.C.

Anne Flowers, Georgia Southern University, Statesboro.

Barbara Peterson, Seven Oaks Elementary School, Columbia, South Carolina.

Eva Galambos, Southern Regional Education Board, Atlanta, Georgia.

Robert [illegible], Pennsylvania State Department of Education, Harrisburg.

Ralph Turlington, Florida State Department of Education, Tallahassee.

Gail MacColl, National Institute of Education, Washington, D.C.

Kathy Jones, Roane State Community College, Harriman, Tennessee, representing the National Education Association.

Mary Lou Romaine, Atlanta Federation of Teachers, Georgia, representing the American Federation of Teachers.

Janet Towslee-Collier, Georgia State University, Atlanta, representing the Association of Teacher Educators.

Robert Fortenberry, Jackson City Schools, Mississippi, representing the American Association of School Administrators.

Nicholas Hobar, West Virginia Department of Education, Charleston, representing the National Association of State Directors of Teacher Education and Certification.

Fred Loveday, Georgia Private Education Council, Smyrna, representing the Council for American Private Education.

James Loudon, Alabama Christian Education Association, Prattville, representing the American Association of Christian Schools.

J. L. Grant, Florida State University, Tallahassee, representing the American Association for Colleges of Teacher Education.

Carolyn Huseman, Georgia State Board of Education, representing the National Association of State Boards of Education.

Robert Fontenot, University of Southwestern Louisiana, LaFayette.

Nancy Rosemore, Camden High School, South Carolina.

Eugene Kelly, George Washington University, Washington, D.C.

Richard Hodges, Decatur, Georgia.

James Gray, University of California, Berkeley.

Esther Dixon, Institute for Research, Development and Engineering in Nuclear Energy, Atlanta, Georgia.

Pat Woodall, Columbus, Georgia.

Wayne Wheatley, Furman University, Greenville, South Carolina, representing the Council for Exceptional Children

Joe Hasenstab, Project Teach, Westwood, New Jersey

William Drummond, University of Florida, Gainesville

Debbie Yoho, Southeastern Regional Teacher Center, Columbia, South Carolina

Donald Gallehr, Virginia Writing Project, Fairfax

James Collins, National Council of States on In-service Education, Syracuse, New York

Ann Levy, Project New Adventure in Learning, Tallahassee, Florida

Bill Katzenmeyer, University of South Florida, Tampa

Walt Mika, Virginia Education Association

Eunice Sims, Georgia Writing Project, Atlanta

Elaine Banks and Sam Sava, National Association of Elementary School Principals, Reston, Virginia

Alandine A. Barchiesi, Masontown, Pennsylvania

Roy Edelfelt, Washington, D.C.

Ed Foglia, California Teachers Association, Burlingame

June Johnson, New Adventure in Learning, Tallahassee, Florida

Richard A. Krueger, Staples Teacher Center, Minnesota

Clare Mitchell, Eagle Forum Education Committee, Schaumburg, Illinois

Donald L. Rubin, University of Georgia, Athens, representing the Speech Communication Association Committee on Assessment and Testing

Daryl R. Yost, East Allen County Schools, New Haven, Indiana

RELATED ACTIVITIES IN ATLANTA

Site Visits: Douglass High School, L.W. Butts, Principal; Mays High School, Thomas E. Wood, Jr., Principal.

Lunch with local dignitaries hosted by Georgia State University.

Dinner with business, education, and community leaders: Coordinated by the Atlanta Partnership of Business and Education; Sponsored by FABRAP Architects, Inc., and the Coca-Cola Company.

College Admissions and the Transition to Postsecondary Education

Clifford Sjogren, University of Michigan, Ann Arbor.

Ralph McGee, New Trier Township High School, Winnetka, Illinois.

Alice Cox, University of California Systemwide Administration, Berkeley.

George Stafford, Prairie View A&M University, Texas.

Fred Hargadon, Stanford University, California.

Margaret MacVicar, Massachusetts Institute of Technology, Cambridge.

Lois Minnema, National Association of College Admissions Counselors, Rolling Meadows, Illinois.

Ora McConner, Chicago Public Schools, Illinois.

Theodore Brown, Hales Franciscan High School, Chicago, Illinois.

Charles D. O'Connell, University of Chicago, Illinois.

Oscar Shabat, Chicago Community College System, Illinois.

Arnold Mitchem, Marquette University, Milwaukee, Wisconsin.

Michael Kane, Educational Testing Service, Midwestern Regional Office, Evanston, Illinois.

John E. Vaccaro, The College Board, Midwestern Regional Office, Evanston, Illinois.

William Kinnison, Wittenberg University, Springfield, Ohio.

William J. Pappas, Northview High School, Grand Rapids, Michigan.

Carmelo Rodriguez, ASPIRA of Illinois, Chicago.

Jeffrey Mallow, Loyola University, Chicago, Illinois.

Carol Elder, Local 4100 of American Federation of Teachers, Chicago, Illinois.

Bettye J. Lewis, Michigan Alliance of Families.

Rachel Ralya, Michigan Alliance of Families.

Austin Doherty, Alverno College, Milwaukee, Wisconsin.

Gordon M. Ambach, State Education Department, Albany, New York.

Gordon C. Godbey, Pennsylvania Association for Adult Continuing Education.

Daryl R. Yost, East Allen County Schools, New Haven, Indiana.

Related activities in Chicago

Site Visits: Standard Oil of Indiana, Gene R. Cartwright, Manager of Employee Relations and Joseph Feeney, Director, Training and Personnel Planning; Continental Illinois Bank, Jennifer [illegible], Personnel Manager; De Paul University, Rev. John T. Richardson, President and David Justice, Dean, School for New Learning.

Luncheon with leaders of higher education institutions; Sponsored by the John D. and Catherine T. MacArthur Foundation.

Dinner with business, education, and community leaders; Sponsored by the John D. and Catherine T. MacArthur Foundation; Chaired by Stanley O. Ikenberry, President, University of Illinois.

Education for a Productive Role in a Productive Society

Daniel Saks, Brookings Institution, Washington, D.C.

Roy Forbes, Education Commission of the States, Denver, Colorado.

Sol Hurwitz, Committee for Economic Development, New York, New York.

Martha [illegible], Naval Education and Training for Research and Development, Pensacola, Florida.

Norman Pledger, Colorado AFL-CIO, Denver.

Lauretta Jones, Storage Technology, Inc., Louisville, Colorado.

Kathy Collins Smith, American Institute of Banking, Denver, Colorado.

Wade Murphree, Denver Institute of Technology, Colorado.

Calvin Frazier, State Department of Education, Denver, Colorado.

Robert Taylor, The Ohio State University, Columbus.

John Peper, Jefferson County Schools, Lakewood, Colorado.

Michael A. MacDowell, Joint Council on Economic Education, New York, New York.

Larry Brown, 70001, Inc., Washington, D.C.

Robert Stewart, University of Missouri, Columbia.

Gordon Dickinson, Colorado Community College and Vocational Education Board, Sterling.

Karl Weiss, Northeastern University, Boston, Massachusetts.

Donald Schwartz, University of Colorado, Colorado Springs.

Patricia Breivik, Auraria Library and Media Center, Denver, Colorado.

John Dromgoole, National Commission on Cooperative Education, Boston, Massachusetts.

Faith Hamre, Littleton Public Schools, Colo.

Vernon Broussard, National Council on Vocational Education, Culver City, California.

David Terry, Utah System of Higher Education, Salt Lake City.

Georgia Van Adestine, Western Michigan University, Kalamazoo, Michigan.

Gordon E. Heaton, Colorado Education Association, Aurora, Colorado.

Young Jay Mulkey, American Institute for Character Education, San Antonio, Texas.

George P. Rusteika, Far West Laboratory for Educational Research and Development, San Francisco, California.

Donald Clark, National Association for Industry-Education Cooperation, Buffalo, New York.

Jacqueline Danzberger, Youth-Work, Inc., Washington, D.C.

Charles Davis, Education Clinics, Inc., Seattle, Washington.

Dennis A. Dirksen, San Diego State University, California.

Ben Lawrence, National Center for Higher Education Management Systems, Boulder, Colorado.

Bill Rosser and Jennie Sanchez, Chicano Education Project, Denver, Colorado.

Sandra K. Squires, University of Nebraska, Omaha.

Related activities in the Denver area

Site Visits: Warren Occupational Technical Center, Golden, Byron Tucker, Principal; Mountain Bell Education and Training Center, Lakewood, Fred Wells, Director; Career Education Center, Denver, John Adams, Principal; Emily Griffith Opportunity School, Denver, Butch Thomas, Principal.

Luncheon discussion with Robert Worthington, Assistant Secretary for Vocational and Adult Education, U.S. Department of Education, Washington, D.C.

Dinner discussion with Willard Wirtz, National Institute for Work and Learning, Washington, D.C., and Henry David, National Institute of Education, Washington, D.C.

Dinner with business, education, and community leaders, Sponsored by the Education Commission of the States, Chaired by Calvin Frazier, Commissioner of Education, Colorado.

Education for the Gifted and Talented

James J. Gallagher, University of North Carolina, Chapel Hill.

Marvel Kleinberg, Eunice Kennedy Shriver Center, Waltham, Massachusetts.

Joseph Renzulli, University of Connecticut, Storrs.

David Feldman, Tufts University, Medford, Massachusetts.

William Durden, Johns Hopkins University, Baltimore, Maryland.

Connie Steele, Texas Technical University, Lubbock.

Ira Kalfel Zimmerman, Lexington Public Schools, Massachusetts.

Alexinia Baldwin, State University of New York, Albany.

Arthur Pontarelli, Rhode Island State Department of Education, Providence.

Armand E. Batastini, Jr., Rhode Island State Legislature, Providence.

William R. Holland, Narragansett School District, Rhode Island.

Melissa Lawton, Bristol School District, Rhode Island.

Rachel Christina, Bristol School District, Rhode Island.

Catherine Valentino, North Kingstown School District, Rhode Island.

Marie Friedel, National Foundation for Gifted and Creative Children, Providence, Rhode Island.

Marcia R. Berger, Rhode Island Federation of Teachers, Providence.

Sidney Rollins, Rhode Island College, Providence.

David Laux, State Advocates for Gifted Education, Providence, Rhode Island.

James A. Di Prete, Coventry High School, Rhode Island.

Harold Raynolds, Maine State Department of Education, Augusta.

June K. Goodman, Connecticut State Board of Education, Hartford.

Mary Hunter Wolfe, Connecticut State Task Force on Gifted and Talented Education, Hartford.

Paul Bagnier, speaking on behalf of Gordon Ambach, State Education Department, Albany, New York.

Benson Snyder, Massachusetts Institute of Technology, Cambridge, Massachusetts.

June Cox, Sid Richardson Foundation, Fort Worth, Texas.

Loretta L. Primeau, Needham Public Schools, Massachusetts, representing the National Education Association.

Patricia O'Connell, Augusta, Maine, representing the Council of State Directors for Programs for the Gifted.

Virginia Ehrlich, Astor Program Studies for Gifted, Suffern, New York.

Gloria Duclos, University of Southern Maine, Portland.

Anton Lipy, Londonderry School District, New Hampshire.

Rhoda Spear, New Haven Schools, Connecticut.

Judith Grunbaum, Southeastern Massachusetts University, North Dartmouth.

Vincent Rowe, American Association of State Colleges and Universities, Washington, D.C.

Dorothy Moore, Mortar Board, Inc., Columbus, Ohio.

Wendy Marcks, Chelmsford Association for Talented and Gifted, Massachusetts.

James DeLisle, University of Connecticut, Storrs.

Naomi Zymelman, Charles E. Smith Jewish Day School, Rockville, Maryland.

Sherry Earle, Connecticut Association for the Gifted, Danbury.

C. Grey Austin, University of Georgia, Athens.

Sally Reis, Council for Exceptional Children, Talented and Gifted Division, Reston, Virginia.

Betty T. Olson, Brockton Public Schools, Massachusetts.

Roberta McHardy, Louisiana Department of Education, Baton Rouge.

Felicity Freund, Gifted Child Society, Oakland, New Jersey.

Lydia Smith, Simmons College, Boston, Massachusetts.

Betsy Buchbinder, Massachusetts Association for Advancement of Individual Potential, Milton.

Artemis Kirk, Simmons College, Boston, Massachusetts, representing the Association of College and Research Libraries.

Elizabeth P. Abbott, Governor's Program for Gifted and Talented, Gainesville, Florida.

James Alvino, Gifted Child Newsletter, Sewell, New Jersey.

Gordon M. Ambach, State Education Department, Albany, New York.

Association of San Diego Educators for the Gifted and Talented, California.

Philip J. Burke and Karen A. Verbeke, University of Maryland, College Park.

Sheila Brown, Nebraska Department of Education, Lincoln.

California Association for the Gifted, Downey.

Carolyn M. Callahan, The Association for the Gifted.

Anne B. Crabbe, Coe College, Cedar Rapids, Iowa.

Roxanne H. Cramer, American Mensa, Arlington, Virginia.

Neil Daniel, Texas Christian University, Fort Worth.

Sue Ellen Duggan and Mary Lou Fernandez, Lackawanna City School District, New York.

John F. Feldhusen, Purdue University, West Lafayette, Indiana.

Frank F. Fowle, III, Clayton, Missouri.

Joseph Harrington, College Academy, Stoughton, Massachusetts.

Anne E. Impellizzeri, American Association for Gifted Children.

Betty Johnson, Minnesota Council for the Gifted and Talented, Minneapolis.

Nancy Kalajian, Sommerville, Massachusetts.

John Lawson, Massachusetts Department of Education, Quincy.

Barbara Lindsey, Southwest Iowans for Talented and Gifted, Council Bluffs.

Diane Modest, Framingham Public Schools, Massachusetts.

Jack L. Osmond, Office for the Gifted, Port Elizabeth, South Africa.

Arthur Purcell, Resource Policy Institute, Washington, D.C.

Annette Raphel, Milton Academy, Massachusetts.

Suzanne Richert, Educational Improvement Center, Sewell, New Jersey.

Carl L. Riehm, Virginia State Department of Education, Richmond.

Terry Ruby, Raynham Public Schools, Massachusetts.

Barbara Moore Schuch, San Diego City Schools, California.

Dorothy Sisk, University of South Florida, Tampa.

Mercedes Smith, Gifted Association of Missouri, Springfield.

Christopher L. Sny, Janesville Public Schools, Wisconsin.

Julian C. Stanley, SMPY, Department of Psychology, Johns Hopkins University, Baltimore, Maryland.

Jo Thomason and Frederick J. Weintraub, Council for Exceptional Children, Reston, Virginia.

Jo Anne Welch, Mississippi Association for the Talented and Gifted.

Related activities in the Boston area

Site Visits: Buckingham, Brown and Nichols School, Cambridge, Peter Gunness, Headmaster; Brookline High School, Brookline, Robert McCarthy, Headmaster.

Secretary's Regional Representatives

The Secretary's Regional Representatives held their own conferences or hearings for educators in their regions in order to provide additional testimony to the Commission. In addition to these events, they also supported the hearings the Commission sponsored in their regions.

Region I, Wayne Roberts, Boston, Massachusetts, Forum on Effective Schools, September 16, 1982.

Region II, Lorraine Colville, New York, New York, Forum on Excellence, October 21, 1982.

Region III, Joseph Ambrosino, Philadelphia, Pennsylvania, Hearing/Conference on Cooperative Education, October 11, 1982.

Region IV, Ted B. Freeman, Atlanta, Georgia, Public Meeting on Excellence in Education, October 22, 1982.

Region V, Harold Wright, Chicago, Illinois, Excellence in Education: Preparation for the Transition to Higher Education, October 6, 1982.

Region VI, Scott Tuxhorn, Dallas, Texas, Public Hearing on Excellence in Education, October 4, 1982.

Region VII, Cynthia A. Harris, Kansas City, Missouri, Rural and Small Schools Excellence, October 26, 1982.

Region VIII, Tom Tancredo, Denver, Colorado, Conference on Excellence in Education, November 12-13, 1982.

Region IX, Eugene Gonzales, San Francisco, California, The Teacher: Key to Excellence in the Classroom, October 19, 1982.

Region X, George Hood, Seattle, Washington, Public Hearing, June 25, 1982, August 27, 1982 (Hearing Officer: Hyrum M. Smith).

Transcripts of the preceding hearings sponsored by and for the Commission will be available in the ERIC System (See Ordering Information).

In addition to these hearings sponsored by and for the Commission, Commission members participated in a series of site visits and a public hearing focusing on Excellence in Rural Education. These events took place on April 23-24, 1982, in Kentucky. The hearing was held at the University of Kentucky-Somerset Community College.

Appendix E: Other presentations to the Commission

Adrienne Bailey, The College Board, New York, New York.

Stephen Bailey, Harvard Graduate School of Education, Cambridge, Massachusetts.

Irene Bandy, Ohio Department of Education, Columbus.

Elias Blake, Clark College, Atlanta, Georgia.

Lewis M. Branscomb, National Science Board, Washington, D.C.

David Burnett, University of Pennsylvania, Philadelphia.

Lawrence Cremin, Teachers College, Columbia University, New York, New York.

James V. Gaddy, New Rochelle High School, New York.

John Goodlad, University of California, Los Angeles.

Elaine Hairston, Ohio Board of Regents, Columbus.

John Hurley, INA Corporation (Now CIGNA), Philadelphia, Pennsylvania.

Edward Kelly, State University of New York at Albany.

Robert McMillan, University of Rhode Island, Kingston.

Edward Pellegrino, Georgetown Medical Center, Washington, D.C.

Francis Roberts, National Endowment for the Humanities, Washington, D.C.

David S. Seeley, Staten Island, New York.

John Sprott, U.S. Department of State, Washington, D.C.

Carol Stoel, U.S. Department of Education, Washington, D.C.

Abraham Tannenbaum, Teachers College, Columbia University, New York, New York.

Harold Tragash, Xerox Corporation, Stamford, Connecticut.

Appendix F: Notable programs

Institutions Which Submitted Profiles of Programs

With the assistance of a variety of organizations, the Commission conducted four searches for examples of notable programs and promising approaches to specific problems in American education. Our purpose was to understand better how schools, school districts, colleges, and other education organizations were defining and addressing these problems. Where the evidence was convincing, we also sought to learn what made successful programs work in different settings.

The Commission's procedure in these four searches was to solicit original profiles of these programs and approaches, profiles that would answer a number of key questions concerning their purpose, content, organization, impact, and transferability.

Evidence of program success was provided wholly by the institution submitting the profile. The Commission is, thus, in no position to validate these programs or to claim any of them to be "exemplary."

Over 200 schools, school districts, colleges and other educational organizations responded to our solicitations. They sent in profiles and other descriptions of nearly 300 programs. Due to the specific problems on which we were seeking information (e.g. the transition from secondary to postsecondary education, the use of educational technology, mathematics education, cooperative educational ventures with business and industry), most of the respondents were postsecondary institutions. But many of the profiles submitted by colleges involved programs developed for or with elementary and/or secondary schools and are in operation in many school districts.

For their assistance in the efforts to identify and collect this information, we are particularly grateful to the American Council on Education, the American Association for Higher Education, the American Association of State Colleges and Universities, the American Association of Community and Junior Colleges, the National Association of Secondary School Principals, the Academy for Educational Development, the Council on American Private Education, and the Fund for the Improvement of Postsecondary Education.

The following document will be available in the ERIC System sometime after July, 1983 (See Ordering Information):

Authors and Paper:

Clifford Adelman, National Institute of Education, Washington, D.C.; Elaine Reuben, Elaine Reuben Associates, Washington, D.C.: "Notable Programs in American Postsecondary Education: Selected Analytical Abstracts".

Appendix G: Acknowledgments

We want to express particular appreciation to the Commission staff which, under the leadership of Executive Director Milton Goldberg, assisted us in our work and helped prepare this report. The staff included: Betty S. Eaton, Stella Carol Foley, Peter H. Gerber, James Harvey, Arnetta D. LeGreene, Alice M. Longworth, Mollie Shannahan MacAdams, Penny S. McDonald, Sheila L. Sam, Harolde K. Spriggs, Tommy M. Tomlinson, Susan Traiman, and Patricia A. Welch.

Others who assisted us at various times throughout the course of our work include: Clifford Adelman, Ned Chalker, Cheryl Chase, Antoine M. Garibaldi, Bruce Harmon, Carolyn Johnson, Sharon Jones, Lily A. Eliot, Andrew M. Lebby, Beverly Lindsey, Carolyn Lowe, Irene Lykes, Claude Mayberry, John M. Mays, Brad Mitchell, Jean Narayanan, Lewis Pike, Joanne Sanders, Ramsay Selden, Gary Sykes, and Marilyn A. Toppozada. Also, the Commission owes a considerable debt to Editorial Experts, Inc., and Morgan-Burchette Associates, both of Alexandria, Virginia, and in particular to Bruce Boston, Karen Burchette, Lee Mickle, and Ian McNett, for invaluable assistance in designing, editing, and producing this volume.

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HIGH SCHOOL: AN AGENDA FOR ACTION

Ernest L. Boyer, former United States Commissioner of Education, was selected by his peers in a national survey in 1983 as the nation's leading educator. For three decades Dr. Boyer has devoted his career to school and college reform and to the advancement of education.

The world has changed, irrevocably so, and quality education in the 1980s and beyond means preparing all students for the transformed world the coming generation will inherit. To achieve this goal, a comprehensive school-improvement program must be pursued urgently. Without excellence in education, the promise of America cannot be fulfilled. We have identified twelve priorities that, taken together, provide an agenda for action.

I. Clarifying Goals

A high school, to be effective, must have a clear and vital mission. Educators must have a shared vision of what, together, they are trying to accomplish. That vision should go beyond keeping students in school and out of trouble, and be more significant than adding up the Carnegie course units the student has completed. Specifically, we recommend:

- Every high school should establish clearly stated goals—purposes that are widely shared by teachers, students, administrators and parents.
- School goals should focus on the mastery of language, on a core of common learning, on preparation for work and further education, and on community and civic service.

The Carnegie Foundation is an education policy center established by Andrew Carnegie in 1905. Dr. Boyer is its eighth president.

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II. The Centrality of Language

The next priority is language. Formal schooling has a special obligation to help all students become skilled in the written and oral use of English. Those who do not become proficient in the primary language of the culture are enormously disadvantaged in school and out of school as well. The following recommendations are proposed:

- Elementary school should build on the remarkable language skills a child already has acquired. In the early grades, students should learn to read and comprehend the main ideas in a written work, write standard English sentences and present their ideas orally.
- The English proficiency of all students should be formally assessed before they go to high school. A pre-high school summer term and an intensive freshman year remediation program should be provided for students who are deficient in the use of English.
- Clear writing leads to clear thinking; clear thinking is the basis of clear writing. Therefore, all high school students should complete a basic English course with emphasis on writing. Enrollment in such classes should be limited to twenty students, and no more than two such classes should be included in the teacher's regular load.
- The high school curriculum should also include a study of the spoken word. Speaking and listening are something more than the mere exchange of information. Communication at its best should lead to genuine understanding.

III. The Curriculum Has a Core

A core of common learning is essential. The basic curriculum should be a study of those consequential ideas, experiences, and traditions common to all of us by virtue of our membership in the human family at a particular moment in history. The content of the core curriculum must extend beyond the specialties, and focus on more transcendent issues, moving from courses to coherence. The following are recommended:

- The number of required courses in the core curriculum should be expanded from one-half to two-thirds of the total units required for high school graduation.
- In addition to strengthening the traditional courses in literature, history, mathematics and science, emphasis should also be given to foreign language, the arts, civics, non-Western studies, technology, the meaning of work, and the importance of health.

Highlights of the core curriculum are as follows:

Literature: All students, through a study of literature, should discover our common literary heritage and learn about the power and beauty of the written word.

United States History: United States history is required for graduation from all the high schools included in our study, and it is the one social studies course uniformly required by most states. We favor a one-year United States history course that would build on the chronology of the emergence of America, including a study of the lives of a few influential leaders—artists, reformers, explorers who helped shape the nation.

Western Civilization: Beyond American history lies the long sweep of Western Civilization. We recommend that all students learn about the roots of our national heritage and traditions through a study of other cultures that have shaped our own.

Non-Western Civilization: All students should discover the connectedness of the human experience and the richness of other cultures through an in-depth study of the non-Western world. Specifically, we suggest a one-semester required course in which students study, in considerable detail, a single non-Western nation.

Science and the Natural World: The study of science introduces students to the processes of discovery—what we call the scientific method—and reveals how such procedures can be applied to many disciplines and to their own lives. We suggest a two-year science sequence that would include basic courses in the biological and physical sciences.

Technology: All students should study technology: the history of man's use of tools, how science and technology have been joined, and the ethical and social issues technology has raised.

Mathematics: In high school, all students should expand their capacity to think quantitatively and to make intelligent decisions regarding situations involving measurable quantities. Specifically, we believe that all high schools should require a two-year mathematics sequence for graduation and that additional courses be provided for students who are qualify to take them.

Foreign Language: All students should become familiar with the language of another culture. Such studies should ideally begin in elementary school and at least two years of foreign language study should be required of all high school students. By the year 2000, the United States could be home to the world's fifth largest population of persons of Hispanic origin. It does seem reasonable for all schools in the United States to offer Spanish.

The Arts: The arts are an essential part of the human experience. They are not a frill. We recommend that all students study the arts to discover how human beings use nonverbal symbols and communicate not only with words but through music, dance, and the visual arts.

Civics: A course in American government—traditionally called civics—should be required of all students, with focus on the traditions of democratic thought, the shaping of our own governmental structures, and political and social issues we confront today.

Health: No knowledge is more crucial than knowledge about health. Without it, no other life goal can be successfully achieved. Therefore, all students should learn about the human body, how it changes over the life cycle, what nourishes it and diminishes it, and how a healthy body contributes to emotional well-being.

Work: The one-semester study of work we propose would ask how attitudes toward work have changed through the years. How do they differ from one culture to another? What determines the status and rewards of different forms of work? Such a curriculum might also include an in-depth investigation of one specific occupation.

- All students, during their senior year, should complete a Senior Independent Project, a written report that focuses on a significant social issue and draws upon the various fields of study in the academic core.

IV. Transition: To Work and Learning

The high school should help all students move with confidence from school to work and further education. Today, we track students into programs for those who "think" and those who "work," when, in fact, life for all of us is a blend of both. Looking to the year 2000, we conclude that, for most students, twelve years of schooling will be insufficient. Today's graduates will change jobs several times. New skills will be required, new citizenship obligations will be confronted. Of necessity, education will be lifelong. We recommend:

- The school program should offer a single track for all students, one that includes a strong grounding in the basic tools of education and a study of the core curriculum. While the first two years would be devoted almost exclusively to the common core, a portion of this work would continue into the third or fourth year.
- The last two years of high school should be considered a "transition school," a program in which about half the time is devoted to "elective clusters."
- The "elective cluster" should be carefully designed. Such a program would include advanced study in selected academic subjects, the exploration of a career option, or a combination of both.
- In order to offer a full range of elective clusters, the high school must become a connected institution. Upper-level specialty schools (in the arts or science or health or computers, for example) may be appropriate in some districts. High schools should also establish connections

with learning places beyond the schools—such as libraries, museums, art galleries, colleges and industrial laboratories.

There is also an urgent need to help students figure out what they should do after graduation. Therefore, we recommend:

- Guidance services should be significantly expanded. No counselor should have a case load of more than one hundred students. Moreover, school districts should provide a referral service to community agencies for those students needing frequent and sustained professional assistance.
- A new Student Achievement and Advisement Test (SAAT) should be developed, one that could eventually replace the SAT. The academic achievement portion of the test would be linked to the core curriculum, evaluating what the student has learned. The advisement section would assess personal characteristics and interests to help students make decisions more intelligently about their futures. The purpose is not to screen students out of options but to help them move on with confidence to colleges and to jobs.

The needs of the student for guidance are matched by the need of the school to be better informed about its graduates. To achieve this, the following is proposed:

- The United States Department of Education—working through the states—should expand its national survey of schools to include a sampling of graduates from all high schools at four-year intervals to learn about their post-high school placement and experience. Such information should be made available to participating schools.

V. Service: The New Carnegie Unit

Beyond the formal academic program the high school should help all students meet their social and civic obligations. During high school young people should be given opportunities to reach beyond themselves and feel more responsibly engaged. They should be encouraged to participate in the communities of which they are a part. We recommend:

- All high school students should complete a service requirement—a new Carnegie unit—that would involve them in volunteer work in the community or at school. Students could fulfill this requirement evenings, weekends and during the summer.
- Students themselves should be given the responsibility to help organize and monitor the new service program and to work with school officials to assure that credit is appropriately assigned.

VI. Teachers: Renewing the Profession

The working conditions of teachers must improve. Many people think teachers have soft, undemanding jobs. The reality is different. Teachers are expected to work miracles day after day and then often get only silence from the students, pressure from the principal, and criticism from the irate parent. To improve the working conditions of the teachers, we propose the following:

- High school teachers should have a daily teaching load of four regular class sessions. In addition, they should be responsible one period each day for small seminars and for helping students with independent projects.
- Teachers should have a minimum of sixty minutes each school day for class preparation and record keeping. The current catch-as-catch-can "arrangement" is simply not good enough.
- Teachers should be exempt from routine monitoring of halls, lunchrooms, and recreation areas. School clerical staff and parent and student volunteers should assume such noninstructional duties.
- A Teacher Excellence Fund should be established in every school—a competitive grant program to enable teachers to design and carry out a special professional project.
- Good teachers should be given adequate recognition and rewards—from a student's "thank you," to cash awards, to active support from parents. Outstanding teachers also should be honored annually in every school district, and, statewide, by the governor and the legislature, newspapers and other businesses in each community.

- Teachers should be supported in the maintenance of discipline based on a clearly stated code of conduct.

Teachers' salaries should be increased. When teachers' salaries are compared to those of other professionals, the contrast is depressing. For many teachers, moonlighting has become essential. Salaries for teachers must be commensurate with those of other professions, and with the tasks teachers must perform.

- As a national goal, the average salary for teachers should be increased by at least 25 percent beyond the rate of inflation over the next three years, with immediate entry-level increases.

Outstanding students should be recruited into teaching. We cannot have gifted teachers if gifted students do not enter the classrooms of the nation. When salaries and working conditions improve, prospects for recruiting talented young people will improve as well. We propose:

- Every high school should establish a cadet teacher program in which high school teachers identify gifted students and encourage them to become teachers. Such students should be given opportunities to present information to classmates, tutor other students who need special help, and meet with outstanding school and college teachers. Also some districts may wish to establish a magnet school for prospective teachers.
- Colleges and universities should establish full tuition scholarships for the top 5 percent of their gifted students who plan to teach in public education. These scholarships would begin when students are admitted to the teacher preparation program at the junior year.
- The federal government should establish a National Teacher Service, especially for those who plan to teach in science and mathematics. This tuition scholarship program would be for students in the top one-third of their high school graduating classes. Students admitted to the National Teacher Service would be expected to complete successfully an academic program and teach at least three years in the public schools.

The schooling of teachers must improve. There are serious problems with the education of our teachers. Many teacher training programs are inadequate. The accreditation of schools of education is ineffective. The careful selection of teacher candidates is almost nonexistent, and college arts and science departments fail to recognize the critical role they play in teacher preparation. The following is proposed:

- Prospective teachers should complete a core of common learning, one that parallels in broad outline the high school core curriculum proposed in this report.
- Every teacher candidate should be carefully selected. Formal admission to teacher training should occur at the junior year, the time when students begin a three-year teacher preparation sequence. Only students with a cumulative grade point average of 3.0 (B) or better and who have strong supportive recommendations from two professors who taught them in a required academic course should be admitted.
- Once admitted to the program, the teacher candidate should devote the junior and senior years to the completion of a major, plus appropriate electives. Every secondary school teacher should complete a sharply focused major in one academic discipline, not in education. During the junior and senior years, time also should be scheduled for prospective teachers systematically to visit schools.
- After grounding in the core curriculum and a solid academic major, prospective teachers should have a fifth-year education core built around the following subjects: Schooling in America, Learning Theory and Research, The Teaching of Writing, and Technology and Its Uses.
- The fifth year also should include classroom observation and teaching experience. This is the best way, we believe, to learn about students and to develop effective methods of instruction.
- In addition, the fifth year of teacher preparation should include a series of six one-day common learning seminars in which students meet with outstanding arts and science scholar-teachers who would

relate the knowledge of their fields to a contemporary political or social theme. Such seminars would help provide the interdisciplinary perspective every high school teacher must acquire.

The continuing education of the teacher must be strengthened. We cannot expect a teacher trained twenty years ago to prepare students to live forty years into the future with no policy of systematic continued education for the teacher. Even the most dedicated teacher will fall behind, and students will learn how to live, not in the future, but in the past. School boards must accept lifelong learning as an essential condition for every teacher.

- A two-week Teacher Professional Development Term should be added to the school year, with appropriate compensation. This term for teachers would be a time for study, a period to improve instruction and to expand knowledge. The planning of such a term should be largely controlled by teachers at the school or district level.
- Every school district should establish a Teacher Travel Fund to make it possible for teachers, based on competitive application, to travel occasionally to professional meetings to keep current in their fields.
- Every five years, teachers should be eligible to receive a special contract—with extra pay to match—to support a Summer Study Term. To qualify and compete for this extended contract, each teacher would prepare a study plan. Such a plan would be subject to review and approval both by peers and by the school and district administrations.

A career path for teachers should be developed. Two of the most troublesome aspects of the teaching profession today are the lack of a career ladder and the leveling off of salaries. The irony is that to "get ahead" in teaching, you must leave it. Good teachers must be recognized and move forward within the profession, not outside it. Our proposals for restructuring the teaching career are these:

- The credentialing of teachers should be separated from college preparation. To qualify for a credential, each candidate should submit letters of recommendation from members of the faculty in his or her academic major, from faculty in his or her education sequence, and from a teacher who has supervised his or her school internship.

- Before being credentialed, the candidate would also pass a written examination administered by a Board of Examiners to be established in every state. The majority membership on such a board should be composed of senior classroom teachers.
- After credentialing, a career path based on performance should be available to the teacher, moving from associate teacher to senior teacher.
- With each professional advancement, salary increases should be provided. Such increases would be in addition to cost-of-living and merit pay earned within the ranks.
- The evaluation of teacher performance should be largely controlled by other teachers who themselves have been judged to be outstanding in the classroom.

Skilled professionals should be recruited to teach part-time in the nation's classrooms. More flexible arrangements will be needed to permit highly qualified nonacademic professionals to teach. Such "teachers" could serve in those fields where shortages exist—such as math and science—and provide enrichment in other fields as well. We recommend that:

- School districts should establish a lectureship program to permit qualified nonacademic professionals to teach on a part-time basis. Such teachers would devote most of their time to their regular jobs —in business or government or law or medicine—while also contributing significantly to education.
- School districts should look to recently retired personnel—college professors, business leaders, and others—who, after brief orientation, could teach part-time in high-demand subjects.
- School districts should enter into partnerships with business and industry to create joint appointments. In this way, two-member teacher teams could be created with one member of the team teaching in school for a year or two while the other works at a nonschool job. Then the cycle could be reversed.

- In-and-out teaching terms should be established—permitting a professional to teach for one to three years, step out, and then return for another one-to-three-year term.
- A Part-Time Practitioner Credential should be created in every state to put in place the recommendations we propose.

VII. Instruction: A Time for Learning

Much about good pedagogy is familiar. There remain, however, some old-fashioned yet enduring qualities in human relationships that still work: contagious enthusiasm, human sensitivity, optimism about the potential of the students. Improving instruction requires a variety of changes. We make the following recommendations:

- Teachers should use a variety of teaching styles—lecturing to transmit information, coaching to teach a skill and Socratic questioning to enlarge understanding. But there should be particular emphasis on the active participation of the student.
- For classroom instruction to be effective, expectations should be high, standards clear, evaluation fair, and students should be held accountable for their work.
- Textbooks seldom communicate to students the richness and excitement of original works. The classroom use of primary source materials should be expanded.
- States should ease their control over the selection of textbooks and transfer more authority to the district and local school. Teachers should have a far greater voice in selecting materials appropriate to their own subject areas.

VIII. Technology: Extending the Teacher's Reach

Technology, particularly computers, can enrich instruction. But educators are confused about precisely what the new machines will do. The strategy seems to be buy now, plan later. The absence of computer policy is itself a policy with major risks. A number of important steps should be taken to link computers to school objectives.

- No school should buy computers, or any other expensive piece of hardware, until key questions have been asked—and answered. Why is this purchase being made? Is available software as good as the equipment? What educational objectives will be served? Which students will use the new equipment, when, and why?
- In purchasing computers, schools should base their decisions not only on the quality of the equipment, but also on the quality of the instructional material available. School districts also should take into account the commitment of the computer company to work alone —or in collaboration with other companies—to develop instructional materials for schools.
- Every computer firm selling hardware to the schools should establish a Special Instructional Materials Fund. Such a fund would be used to develop, in consultation with classroom teachers, high-quality, school-related software.
- For technology to be used effectively, teachers must learn about the new equipment. Computer companies should provide technology seminars for teachers to keep them up-to-date on the uses of computers as a teaching tool.
- A National Commission on Computer Instruction should be named by the Secretary of Education to evaluate the software now offered for school use and propose an ongoing evaluation procedure that would be available to the schools. Outstanding teachers should comprise an important segment of such a panel.
- Federal funds should be used to establish ten Technology Resource Centers on university campuses—one in each major region of the nation. These centers would assemble, for demonstration, the latest technology. Also, federally funded regional networks should be developed to make computerized library services available to all schools.
- Schools should relate computer resources to their educational objectives. Specifically, all students should learn *about* computers; learn *with* computers; and, as an ultimate goal, learn *from* computers. The

first priority, however, should not be hands-on experience, but rather educating students about the social importance of technology, of which the computer is a part.

Prospects for a technology revolution in education go far beyond computers. Through the use of television, films, video cassettes, the classroom can be enormously enriched. In this connection, we recommend:

- School districts with access to a cable channel should use the facility for school instruction and a district-wide plan for such use should be developed.
- All commercial television networks should set aside prime-time hours every week to air programs for education and thereby indirectly enrich the school curriculum.
- A National Film Library should be established with federal support. This resource center would secure outstanding film and television programs, both commercial and public offerings, index and edit them, and make them available for school use.

IX. Flexibility: Patterns to Fit Purpose

Our next priority is flexibility. There are many different high schools in the United States, with many different students. Greater flexibility in school size and the use of time will help schools achieve, more effectively, their educational objectives. The urgent need is not more time but better use of time. The following is proposed:

- The class schedule should be more flexibly arranged to permit larger blocks of instructional time, especially in courses such as a laboratory science, a foreign language, and creative writing.
- Small high schools should expand their education offerings by using off-campus sites or mobile classrooms or part-time professionals to provide a richer education for all students.
- Large high schools, particularly those with over 2,000 students, should organize themselves into smaller units—"schools-within-

schools"—to establish a more cohesive, more supportive social setting for all students.

Gifted and talented students represent a unique challenge if they are to realize their potential. Therefore, we suggest:

- Every high school should develop special arrangements for gifted students—credit by examination, independent study, and accelerated programs.
- A network of Residential Academies in Science and Mathematics should be established across the nation. Some academies might be within a densely populated district. Others might serve an entire state. A residential school may serve several states. Academies might be located on college campuses. Such schools should receive federal support since clearly the vital interests of the nation are at stake.

Special arrangements are also needed for students at the other end of the education spectrum. Year after year, about one out of every four students who enroll in school drops out before graduation. This nation cannot afford to pay the price of wasted youth. We recommend:

- Federally supported remedial programs—most of which have been concentrated in the early grades—have demonstrated that improvements can be made in the academic achievement of even the most disadvantaged child. Therefore, the federally funded Elementary and Secondary Education Act (Title I) should be fully funded to support all students who are eligible to participate in this effective program.
- Every high school district, working with a community college, should have a reentry school arrangement to permit dropouts to return to school part time or full time or to engage in independent study to complete their education.

X. The Principal as Leader

What we seek are high schools in which the school community—students, teachers, and principals—sees learning as the primary goal. In such a community, the principal becomes not just the top authority but the key educator, too. Rebuilding excellence in education means reaffirming the importance of the local school and freeing leadership to lead. We make the following recommendations:

- The principal should be well prepared. The basic preparation should follow that of teachers.
- A principal should complete all requirements for licensing as a teacher and serve a year as an "administrative intern." At least two years as an assistant principal should be served before one could assume a full principalship.
- Principals and staff at the local school should have more control over their own budgets, operating within guidelines set by the district office. Further, every principal should have a School Improvement Fund, discretionary money to provide time and materials for program development and for special seminars and staff retreats.
- Principals should also have more control over the selection and rewarding of teachers. Acting in consultation with their staffs, they should be given responsibility for the final choice of teachers for their schools.
- In order to give principals time to reflect upon their work and stay in touch with developments in education, a network of Academies for Principals should be established.

XI. Strengthening Connections

High schools do not carry on their work in isolation. They are connected to elementary and junior high schools and to higher education. In the end, the quality of the American high school will be shaped in large measure by the quality of these connections. School-college relationships can be improved in a variety of ways:

- All states should establish a School-College Coordination Panel to define the recommended minimum academic requirements to smooth the transfer from school to public higher education.

- Every high school in the nation should offer a "university in the school" program and a variety of other arrangements—credit by examination, early admission and advanced placement—to permit able students to accelerate their academic programs.
- Each college or university should form a comprehensive partnership with one or more secondary schools.

Schools need the help of industry and business, and business needs the schools. The quality of work is linked to the quality of education. The following school-business partnerships are proposed:

- Businesses should provide help for disadvantaged students through volunteer tutorial and family counseling service, and support special school and part-time apprenticeship experience for high-risk students.
- Businesses should provide enrichment programs for gifted students, especially those in science and mathematics, and for those in the new technologies.
- Businesses should provide cash awards for outstanding teachers. In addition, they should consider establishing Endowed Chair Programs in the schools, and summer institute arrangements.
- Corporate grants should provide sabbaticals to outstanding principals and a discretionary fund for principals to work with teachers on creative programs. Further, large corporations should donate the use of their training facilities for a week or two each year to house an Academy for Principals.
- To help schools improve their physical plant and science laboratories, business should sponsor a facilities and equipment program. In addition, appropriate industries should conduct inventories of science laboratories and help upgrade school equipment.

XII. Excellence: The Public Commitment

Finally, school improvement is dependent on public commitment. How we as a nation regard our schools has a powerful impact on what occurs in them. Support for schools can take many forms, and it must come from many sources. Citizens, local school boards, state agencies and legislatures, and the federal government must work together to help bring excellence to our public schools. A number of steps are imperative:

- Parent-Teacher-Student Advisory Councils should be established at all schools. Further, a Parent Volunteer Program should be organized to tutor students, provide teacher aides, and other administrative, counseling, and clerical support.
- Parents should become actively involved in school board elections, attend meetings, and be willing to serve as members of the board.
- Boards of education should hold special meetings with representatives of the schools in their districts—principals and teachers—at least once a year.
- A network of community coalitions—Citizens for Public Schools—should be formed across the nation to give leadership in the advocacy of support for public education.
- The states should recognize that their overriding responsibility to the schools is to establish general standards and to provide fiscal support, but not to meddle. The state education law should be revised to eliminate confusing and inappropriate laws and regulations.

To achieve excellence in education the federal government also must be a partner in the process. In this report, we propose that funding of Title I of the Elementary and Secondary Education Act be increased to support all eligible students. We call for a National Teacher Service and a federally-funded network of Residential Academies in Science and Mathematics. We recommend that the federal government help create a National Film Library for schools and that a network of Technology Resource Centers be established with federal support to teach teachers about technology and its uses.

There is yet another urgent school need that calls for a national response. Many of our public schools have fallen into disrepair.

Laboratory equipment is in poor shape. The situation is as alarming as the decay of our highways, dams and bridges. Federal action is needed now to help meet an emergency in the schools. We propose:

- A new School Building and Equipment Fund should be established, a federal program that would provide short term, low interest loans to schools for plant rehabilitation and for the purchase of laboratory equipment.

No one reform can transform the schools. The single solution, the simple answer, may excite a momentary interest but the impact will not last.

In this report we have tried to think inclusively, and to search out interconnected solutions to the schools' interconnected problems. The result is something that is at once a yardstick to measure the need for reform and an agenda for action to bring about that reform.

Not every recommendation we present is appropriate for every school. Each institution will have its own agenda for renewal. What is important is that all high schools take steps to achieve excellence and that this effort be sustained.

We conclude this report on the American high school with the conviction that the promise of public education can be fulfilled and that, as a nation, we will meet the challenge.

MAKING THE GRADE

Report of the
Twentieth Century Fund
Task Force on
Federal Elementary and
Secondary Education Policy

The Twentieth Century Fund is an independent research foundation which undertakes policy studies of economic, political, and social institutions and issues. The Fund was founded in 1919 and endowed by Edward A. Filene.

Report of the Task Force

The nation's public schools are in trouble. By almost every measure—the commitment and competency of teachers, student test scores, truancy and dropout rates, crimes of violence—the performance of our schools falls far short of expectations. To be sure, there are individual schools and school districts with devoted teachers doing a commendable job of educating their students, but too many young people are leaving the schools without acquiring essential learning skills and without self-discipline or purpose. The problem we face was succinctly summed up just three years ago by the President's Commission for a National Agenda for the Eighties when it reported that

> . . . continued failure by the schools to perform their traditional role adequately, together with a failure to respond to the emerging needs of the 1980s, may have disastrous consequences for this nation.*

This Task Force believes that this threatened disaster can be averted only if there is a national commitment to excellence in our public schools. While we strongly favor maintaining the diversity in educational practices that results from the decentralization of the schools, we think that schools across the nation must at a minimum provide the same core components to all students. These components are the basic skills of reading, writing, and calculating; technical capability in computers; training in science and foreign languages; and knowledge of civics, or what Aristotle called the education of the citizenry in the spirit of the polity.

As we see it, the public schools, which constitute the nation's most important institution for the shaping of future citizens, must go further. We think that they should ensure the availability of large numbers of skilled and capable individuals without whom we cannot sustain a complex and competitive economy. They should foster understand-

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*President's Commission for a National Agenda for the Eighties, *A National Agenda for the Eighties* (Washington, D.C.: U.S. Government Printing Office, 1980).

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ing, discipline, and discernment, those qualities of mind and temperament that are the hallmarks of a civilized polity and that are essential for the maintenance of domestic tranquility in a polyethnic constitutional democracy. And they should impart to present and future generations a desire to acquire knowledge, ranging from the principles of science to the accumulated wisdom and shared values that derive from the nation's rich and varied cultural heritage.

These are admittedly formidable tasks that too few schools today come close to accomplishing. The Task Force believes that the schools must make a concerted effort to improve their performance and that there is a clear national interest in helping schools everywhere to do so. That interest can be asserted and dramatized most effectively by the federal government. The federal government, after all, is charged with providing for the security and well-being of our democratic society, which rest largely on a strong and competent system of public education. It is in the best position to focus public attention on the vital importance of quality in our schools and to support its attainment. The federal government should be able to foster excellence in education, serving as a firm but gentle goad to states and local communities without impeding or restricting state and local control of and accountability for the schools.

Excessive Burdens

Before putting forward our proposals for a new federal policy on elementary and secondary schooling, we think it useful to identify what has gone wrong. Why, despite spending more per student than every other advanced nation, is there a growing gap between the goals and achievements of our schools? Many developments—economic, demographic, social, political—have contributed, directly and indirectly. We have always demanded a great deal of our schools, but never before have we demanded of them as much as we have over the past thirty years. On one hand we have charged them with being the melting pot, the crucible for dissolving racial divisiveness, and on the other for sustaining, and even exalting, ethnic distinctiveness.

The schools, moreover, have had to provide a wide array of social services, acting as surrogate parent, nurse, nutritionist, sex counselor, and policeman. At the same time, they are charged with training increasing percentages of the nation's youth, including large numbers of hard-to-educate youngsters, to improved levels of competency so that they can effectively enter a labor market in which employers are currently demanding both technical capability and the capacity to learn new skills. In essence, the skills that were once possessed by only a few must now be held by the many if the United States is to remain competitive in an advancing technological world.

Demographic changes as well as changes in attitudes toward traditional mores and values have also had a marked influence. The schools have had to cope with more children, and especially more problem children, than ever before—those who are without the rudiments of English and those who are unmotivated or prone to violence, quite apart from those who are physically handicapped. Problems have also come about as a result of the ready availability of drugs, the growing number of family breakups and the increased permissiveness in those remaining intact, the distractions of television and of easily affordable video games, the growth of underworld culture.

The difficulties of coping with these burdens have been compounded in some cities by inappropriate judicial intervention and by the spread of the trade-union mentality that has accompanied the bureaucratization and politicization of the schools. As a consequence, already large administrative staffs have burgeoned, and new rules and procedures have been promulgated, forcing classroom teachers to spend more time on paperwork and less on teaching. The rise in teacher and administrative unions has thus helped transform what had been a noble though poorly compensated profession into a craft led by collective bargaining organizations with a focus on bread-and-butter issues—wages, working conditions, and job security (for which read seniority).

The federal courts have been particularly criticized for playing so conspicuous a role. There is no doubt that they were active in enforcing the rights guaranteed by the Fourteenth Amendment, and that their activity was critical to ensuring those rights for many citizens. But the spectacle of judges, who had little knowledge—and no experience—of the intricacies of operating school systems, taking over responsibility was often harmful. More often than not, though, judges had no choice. They acted because politicians in state legislatures and Congress, in state houses and the White House, failed to act. In most jurisdictions no local political leadership emerged; cowardice rather than courage prevailed, creating a leadership vacuum that the courts filled.

The Federal Presence

In recent years the federal executive and legislative branches have enlarged their roles. In the view of some critics, federal intervention looms so large that it has not only overstepped constitutional limitations but bears responsibility for most of the failings of the schools. We consider these criticisms exaggerated. True, since 1965, with the passage of the Elementary and Secondary Education Act (ESEA), the executive branch has intervened, by law and by regulation, in many school activities, tilting the allocation of resources to compensatory education and affirmative action programs. But the achievements of some federal activities must be acknowledged. Its Title I program as well as Head

Start have been particularly successful, especially among children in elementary schools where these programs were concentrated. Even affirmative action programs registered some success, although most were hampered by excessive federal manipulation. Federal involvement was underscored by the establishment of the U.S. Department of Education in 1979–80, but long before it was on the scene some observers claimed that the delicate balance of what had been a complicated but relatively efficient educational system had been needlessly upset by the federal presence.

Many other criticisms of the federal role in elementary and secondary education are warranted, but not the complaint that the federal government has violated its constitutional authority. This Task Force believes that educating the young is a compelling national interest, and that action by the federal government can be as appropriate as action by state and local governments. Certainly, federal intervention was not only appropriate but necessary in bringing about desegregation of the public schools, and in providing needed assistance to poor and handicapped children.

All too often, though, the nature of federal intervention has been counterproductive, entailing heavy costs and undesirable consequences. Direct federal outlays accounted, at their peak, for less than 10 percent of total annual spending on the schools, but by resorting to compulsory regulation and mandated programs, the federal government has swelled school bureaucracies, imposed dubious and expensive procedures, and forced state and local governments to reallocate substantial portions of their scarce revenues. What is more, its emphasis on promoting equality of opportunity in the public schools has meant a slighting of its commitment to educational quality.* Thus, the federal government has not only had a pervasive influence on the spending of local school districts but has undoubtedly played a part in many of the other troubles of the schools.**

Despite all of its shortcomings, however, there is a need for a continued federal role, in part because equality and excellence are not mutually exclusive objectives. We think that both objectives should be

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**Comment by Mr. Riles:* The "slighting of its commitment to educational quality" by the federal government should not be blamed on the promotion of equality of opportunity. As previously stated in this report, Congress has historically "refrained" from addressing the issues of educational quality. I believe it is essential that both issues be addressed.

***Comment by Ms. Graham:* There have been many mistakes in federal education programs, much misplaced money, numerous stupidities. None should be justified. There have also been important achievements, particularly for children from low-income families through Title I of the Elementary and Secondary Education Act, through Head Start, and for young minority children in the vigorously pursued through a fresh approach, one that reflects the national concern for a better-educated America and that strikes a reasonable and effective balance between quality and equality. The federal government must continue to help meet the special needs of poor and minority students while taking the lead in meeting the general and overwhelming need for educational quality. Federal education policy must function, moreover, in ways that complement rather than weaken local control. This calls for a change in direction, replacing the current emphasis on regulations and mandates with a new emphasis on incentives.

The Federal Commitment

Even before there were public schools everywhere, the federal government expressed its commitment to education. The Northwest Ordinance of 1787 specified that land was to be set aside for education purposes in every town and rural area. In the words of the proviso to the ordinance, "Religion, morality, and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged." Thus, soon after the nation's founding, its leaders recognized that the experiment in political democracy upon which they were embarking could not succeed without an educated citizenry.

Seventy-five years later, in the midst of the Civil War, Congress sought to enlist the aid of the nation's educational institutions in the Morrill Act, which granted land for the purpose of supporting colleges of agriculture and mechanical arts. In this century, Congress passed the Smith-Hughes Act, which provided federal support for vocational education, and the National Defense Education Act (NDEA), which, in the immediate aftermath of the Soviet Union's Sputnik, called for improved training in such critical subject areas as science, mathematics, and foreign languages.

Although Congress has from time to time acknowledged the essential need for public education and even for specific kinds of education, it has refrained, apparently deliberately, from addressing the issue of

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(Continued from page 4)

South (especially areas affected by the 1954 *Brown v. Board of Education* desegregation decision). Both the mistakes and achievements are worthy of note. Given the conflicting mandates the public schools have been assigned, the tone of this document is more critical of their performance than I believe justified either by the evidence presented here or from other sources with which I am familiar.

Messrs. Hortas and Wentz wish to associate themselves with Ms. Graham's comment.

educational quality. This matter, with good reason, was left to the discretion of the states and localities. The control of public education, even though subject to constitutional restriction, is exercised by thousands of school boards and school superintendents within a legal framework set up by fifty different state legislatures. There has been no one place—and we do not think there should be—in which a national policy defines the correct school curriculum or the proper qualifications for teachers, or sets forth the precise duration of the school day or year. These are matters that traditionally have been left to lay citizens, reinforced by the advice and counsel of professional educators or schools of education. We believe it should remain that way.

The genius of our decentralized arrangements is that we have managed to forge a national education system that allows room for variations and even for disagreements. This is not to say that the Task Force is satisfied with the performance of local school districts. To the contrary, we believe that the vast majority must do much better. But because learning depends upon intangibles—the leadership provided by a school principal, the chemistry between teachers and students, the extent of parental involvement and support—we strongly favor leaving control over schooling at the local level. Good schools cannot be created by federal mandate. They grow from the ground up in complex and often idiosyncratic fashion. Most good schools have many characteristics in common, but there is no formula that can bring about their duplication because there is no one best way of providing a first-rate education.

Quality of Leadership

Because quality in education is easier to recognize than to define, some of the reluctance of Congress to face up to the issue is understandable. Educational quality cannot be legislated into existence. Still, Congress must not continue to be ostrichlike about the failings of primary and secondary school education. Its readiness to legislate on other aspects of education, whether in programs for the handicapped, or for all those whose English is limited or nonexistent, or for special interests—for example, the National Educational Association—that successfully lobbied for the establishment of the Department of Education while ignoring declines in test scores, suggests to many Americans that quality in education is not a national goal. That false impression must be erased.

This Task Force calls on the executive and legislative branches of the federal government to emphasize the need for better schools and a better education for all young Americans. We have singled out a number of specific areas in which the federal government, mainly through a series of incentives, can act to improve the quality of education in the public schools. Most of our proposals are directed toward improving the quality of teaching, ensuring proficiency in English while developing fluency in foreign languages, and promoting ways to increase proficiency in mathematics and science. We then go on to discuss the nature and content of the federal role in education, what it can do to further quality as well as equality in schooling, and the extent of choice that ought to be made available to parents.

Quality of Teachers

The traditional commitment of teachers to quality education has been challenged by many forces, some that have affected all of society, others that are peculiar to the community of educators. The teacher—along with all other authority figures—does not appear to command the respect commonly accorded a generation ago. The complex organizational structure in which the classroom teacher now operates restricts independence and autonomy; as new organizational positions have proliferated, many of the best teachers have been "promoted" to better paying administrative positions, devaluing the status of the teacher. In addition, the organizations—the unions and professional associations—to which teachers belong have protected their weakest members rather than winning rewards for their strongest. They have promoted the principle of equal pay or, at best, a differential pay scale that primarily takes into account educational background and seniority, thereby limiting the financial incentives available for rewarding superior professional work. The collective bargaining process, moreover, has not only made it difficult to encourage promising teachers or dismiss poor ones, it has forced many of the best to leave teaching for more financially rewarding work. The result is that the quality of teaching suffers.

Deterioration in quality is probably greatest in specialized subjects, most markedly in mathematics and science. Because of the constant need of industry for skilled personnel, teachers in these fields can easily find more profitable employment. This problem is not new, of course, but standardized salary schedules, reinforced by the collective bargaining process, have made for staff shortages in mathematics and science in many local school districts. School boards frequently resort to such stratagems as paying science and mathematics teachers overtime for extra work instead of directly facing up to the unions and to the need to increase salaries for specialized teachers in short supply.

Because the institutional arrangements and procedures governing teachers are so well entrenched, incremental changes in federal policy cannot by themselves dramatically improve the quality of instruction. The Task Force is convinced that what is required is a major federal initiative that unmistakably emphasizes the critical importance of quality teachers in our schools. *We propose the establishment of a national Master Teachers Program, funded by the federal government, that recognizes and rewards teaching excellence.*

Under our proposed program, the best teachers from every state would be awarded the accolade of Master Teacher and a monetary grant—say, $40,000 a year—above that of the ceiling for teachers' salaries for a period of five years. Criteria for selection might be set by such established agencies as the National Endowment for the Humanities, the National Science Foundation, and other federal agencies, with the actual selections made by them after their canvassing of local advisers, including school boards and school administrators, teachers, and parents.

In maintaining Master Teachers in the program for five years, we propose that up to one full year should be devoted to professional improvement through graduate or similar work, and that additional funds, for tuition or for the assistance of graduate students, should be made available for such purposes. The remaining four years would be spent teaching, with perhaps some of that time used to work with and provide help to other teachers.*

Rather than spell out the details of the proposed program, we have set down the guidelines we think should be followed. We recommend the adoption of an incentive approach, establishing clear criteria for teachers of exceptional merit and making the awards numerous enough to attract national attention and substantial enough for long enough to keep Master Teachers in the classroom.

It is our view that the proposed program would help pave the way for reconsideration of merit-based personnel systems for teachers, which we believe would foster improvements in quality. Despite many surveys of public servants and professionals that have disclosed a strong preference for merit pay increases and promotions, school boards and legislators have almost always yielded to union demands for equal pay. Collective bargaining has served teachers and the public by improving working conditions and compensation, and we do not want to see it abandoned. But both the public and teachers would be even better served if the opposing sides in the bargaining process—the unions and local school boards—realized that merit-based systems and collective bargaining are not incompatible.

**Dissent by Ms. Yalow:* I oppose the establishment of a Master Teachers Program. It would be expensive and would not address a real need, namely the shortage of teachers in chemistry, physics, and mathematics. I believe it would hurt morale in that a reward for a limited period to be followed by a period of reduced salary would be a retrogressive step. Moreover, I question whether it is necessary or desirable to give a "Master Teacher" a full year for "professional improvement." What is required is a salary structure that reflects competency and that would aid in recruitment of teachers in short supply. The goals of the proposed Master Teachers Program seem noble, but the mechanism suggested is highly unlikely to have the desired effect.

The Master Teachers Program will be expensive—just how expensive will depend on the number of awards made each year. At a minimum there should be at least one award for each congressional district, but we think that many more should be given. By the fifth year of the program, the cost could run as high as $5 billion.

The Task Force believes that such an expense is warranted. Good teachers are as valuable to the nation as new tanks or fighter planes or a new highway. By making so visible and costly a commitment, the federal government will not only be assuming leadership in the quest for educational excellence but undertaking a major program to help achieve it.

The Primacy of English

Our political democracy rests on the conviction that each citizen should have the capacity to participate fully in our political life; to read newspapers, magazines, and books; to bring a critical intelligence to television and radio; to be capable of resisting emotional manipulation and of setting events within their historical perspective; to express ideas and opinions about public affairs; and to vote thoughtfully—all activities that call for literacy in English. Accordingly, *the Task Force recommends that the federal government clearly state that the most important objective of elementary and secondary education in the United States is the development of literacy in the English language*.

A significant number of young Americans come from homes where English is not the first language, and many now live in neighborhoods in an increasing number of states in which languages other than English are spoken. Although this nation has become more aware of the value of ethnic identities than it was during previous influxes of non-English-speaking immigrants, anyone living in the United States who is unable to speak English cannot fully participate in our society, its culture, its politics. This is not because of prejudice but because most Americans speak, write, and think in English. English is, after all, our national language.

We recommend, then, that students in elementary school learn to read, write, speak, and listen in English. As children advance in grade, these skills should be continually improved. By the time they finish high school, students ought to possess such advanced cognitive skills as reasoning, critical analysis, the ability to explain and understand complex ideas, and to write clearly and correctly.

Many different methods have been proposed for educating children who are not literate in English. It is not the role of the Task Force nor is it the responsibility of the federal government to instruct our schools and teachers on which pedagogy is most appropriate. The federal role, we believe, is to guarantee that all children have equal educational opportunity. Therefore, *the Task Force recommends that federal funds now going to bilingual programs be used to teach non-English-speaking children how to speak, read, and write English.** Local school districts may decide to teach children in more than one language or to teach them a language other than English. Although we believe that the failure to recognize the primacy of English is a grave error, that is their prerogative. The distinctive nature of the federal role, we believe, derives from the premise that all of us must be able to communicate with one another as fellow citizens.

Accordingly, *the Task Force recommends that the federal government promote and support proficiency in English for all children in the public schools, but especially for those who do not speak English, or have only limited command of it.*

At the same time, the Task Force considers the ability to speak and read a second language a valuable resource for both the individual and the nation. Acquiring facility in a foreign language can help to improve a student's understanding and command of English, and lead to the appreciation of the literature and culture of another people, which is clearly educationally desirable. It should also be an advantage in a business or professional career.

From a national perspective, young men and women with proficiency in foreign languages are sorely needed now that we are increasingly involved in competitive trade and investment with the rest of the world. More and more jobs will be available in government, industry, trade, commerce, and the universities for Americans who can converse with other people in their own languages, and who can participate in strengthening our international ties.

This Task Force wants every American public school student to have the opportunity to acquire proficiency in a second language. Unfortunately, there is no practical possibility of obtaining this objective quickly. The neglect of foreign language study and instruction in the United States is of such long standing that we simply do not have enough language teachers to provide adequate training. Nevertheless, we propose that proficiency in a second language should be a long-term

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**Dissent by Mr. Hortas:* It is unquestionable that all students must learn to speak, read, and write English in order to function in our society. Nonetheless, bilingual programs in which children are taught in English and in their native language are essential if we are to provide a healthy learning environment for children of limited English ability. Because local school districts cannot afford to underwrite such programs, I recommend that the proposal on federal impact aid, set forth later in this report, be applied to bilingual programs. The academic achievements of children of limited English-speaking ability will be significantly greater if the child's first language skills are maintained and improved.

goal. We must begin a training program now if we are to achieve that goal in future decades.* The federal government can help in the training of language teachers and in encouraging and assisting in programs for students with proficiency in English to learn a second language that may or may not be a language spoken in their homes.

Our aim is to see this second-language policy sponsored by the federal government and carried out by state and local governments. The immediate need is for a modest matching grant program to train language teachers. Even though it will take time and effort, we think that a comprehensive approach to the study of languages, in which fluency in English is primary but adequate training in a second language is also made available, is absolutely essential if the United States is to be a leader among nations in the next century.**

**Comment by Mr. Hortas:* Every public school student should start the study of a foreign language in elementary school, which is standard educational practice in the developed countries of the world. A knowledge of a second language at an early age will stimulate a better appreciation of our country's cultural pluralism. The achievement of proficiency in a second language must be a project for this decade, not for future generations.

Ms. Graham and Mr. Denny wish to associate themselves with Mr. Hortas's comment.

***Comment by Ms. Yalow:* I am in complete agreement with the Task Force recommendation about the essentiality of all Americans acquiring proficiency in English. In addition, it is desirable to develop a cadre with proficiency in foreign languages. Therefore, I accept that every American public school student should have the opportunity to acquire proficiency in a foreign language. But I really doubt the desirability of recommending that all high school students be required to study a foreign language. Is such competency really necessary for a farmer in Iowa, a coal miner in West Virginia, or a factory worker in the textile mills of the South? It might be highly desirable for a shopkeeper or a secretary in a bilingual community. The extent of competency, whether it should be ability to read, write, or speak fluently, should depend on personal and professional interests.

If there appears to be a severe shortage of foreign language teachers at present, perhaps this shortage would more easily be remedied by taking advantage of the large number of people in our country for whom English is not the first language and who have sufficient fluency in both English and the foreign language to be ideal as teachers. Often they do not have appropriate education courses or the right degrees. It is perhaps heretical to suggest that the education courses or degrees are not essential for teaching students to develop proficiency in a foreign language. Teachers without the right credentials but with competency in the foreign language and English could be employed on an adjunct basis if there are rules against their serving as regular teachers.

Mr. Wentz wishes to associate himself with Ms. Yalow's comment.

In the long run, these recommendations to ensure fluency in English are the only kind that make sense. The nation cannot afford a multiplicity of special language programs in every community in which ethnolinguistic minorities are present in significant numbers. More important, school children to whom English is an alien language are being cheated if it remains unfamiliar to them; they will never swim in the American mainstream unless they are fluent in English. The best way to ensure the nation's linguistic resources is to make literacy in English the primary objective and to promote literacy in a second language as a valuable supplement to, not a substitute for, English.*

Science and Mathematics

At the turn of the twentieth century, there was no real need for widespread scientific literacy. Today, training in mathematics and science is critical to our economy. Our citizens must be educated in science if they are to participate intelligently in political decisions about such controversial issues as radiation, pollution, and nuclear energy. *The Task Force recommends that the federal government emphasize programs to develop basic scientific literacy among all citizens and to provide advanced training in science and mathematics for secondary school students.*

The schools must go beyond the teaching of basic science to give adequate training in advanced science and mathematics to a large enough number of students to ensure that there are ample numbers capable of filling the increasing number of jobs demanding these skills. The Reagan administration has proposed a $50 million scholarship program for students in mathematics and science, which we think is a step in the right direction. The more ambitious programs emerging from Congress move even further in that direction. Our preference is for an incentive program to augment the supply of teachers in science and mathematics as well as in foreign languages. Federal loans might be made available to prospective teachers who exhibit exceptional skills and who are pursuing degree programs in areas of existing or anticipated shortages. Those who complete their educational programs might be forgiven up to 10 percent of the funds lent to them for every year of classroom teaching—for a maximum of five years.

**Comment by Mr. Hortas:* No bilingual program in the United States promotes another language as a *substitute for English*. In fact, intensive English instruction is a part of every bilingual program. Bilingual programs attempt to show that English is not, in and of itself, a superior or richer language than the student's native language. There is a greater social benefit in promoting and encouraging linguistic diversity than in calling for specious uniformity.

Better Education for All

In proposing new federal measures to stimulate national interest in improving the quality of public education, we urge that they not come at the expense of children from low-income families or of children suffering from one or another disability. In recent years the federal education effort has concentrated on the needs of special categories of students—those from low-income homes, the handicapped, the non-English speaking—because states and local governments failed to meet national educational objectives for them. By furnishing special services to the handicapped and by addressing the educational needs of the poor, the federal role has had much the same influence as it had in desegregating the schools. Without such intervention, many states and most local school boards would not have done what clearly needed doing.

But if categorical programs have their uses, critics argue that there are not only too many of them but that many of these proliferating programs are poorly designed. They go on to argue that, while minorities may not have been effectively organized at state and local levels to secure needed programs two decades ago, the political organization and sophistication of such groups has so increased—in part because of federal assistance—that they no longer need the extensive federal protection that they once did. Although this may be the case in many large cities, the political power of minorities is far less potent in most school districts.

Perhaps the most persuasive reason for federal support of categorical programs is that, even under favorable political conditions, few local school systems have the will to concentrate their resources on the minority of students with special needs. Moreover, recent political and economic conditions have been anything but favorable for local governments. The cost of educating children with special needs has forced many school districts to resort to imposing taxes on productive members of the community without providing immediate benefits in return. Business firms along with residents in higher income brackets may choose to leave communities where the tax burden for educating the children of poor, needy residents is relatively heavy. Accordingly, *the Task Force supports continuing federal efforts to provide special educational programs for the poor—and for the handicapped.*

We applaud the steps taken by Congress to simplify regulatory restrictions and to reduce the overlap among many programs. In enacting legislation acknowledging the responsibility of the federal government for groups with special needs, *the Task Force believes that the guiding principle should be that categorical programs required by the federal government should be paid for from the federal treasury.* These categorical programs are not special-interest legislation serving particular groups at the expense of the nation as a whole. To the contrary, compensatory programs and education for the handicapped concentrate limited resources on specific populations and in particular areas where the need for better education is especially urgent, thereby providing the equality of opportunity essential for the well-being of our democracy. Their cost, then, should be assumed by the federal government, not by states or localities, although local school districts must take the responsibility for the effective provision of special help.

The Task Force also recommends that "impact" aid, originally aimed at helping cushion the burden imposed on local school facilities by the children of military personnel, be reformulated to focus on school districts that are overburdened by substantial numbers of immigrant children. During World War II, the influx of the military into particular communities placed unusual burdens on local school districts; currently, when cities and regions compete vigorously for defense spending, the military is often a boon to local economies. Under today's conditions, we believe it fitting that federal impact aid should be used when large numbers of aliens and immigrants, many of whom are poor, place a special burden on local school districts. Given the Supreme Court decision reaffirming the right of children of illegal aliens to equal educational opportunities, the federal government has an obligation to temporarily assist states and localities facing added costs for educating these children, who usually need special help.

A related problem is the plight of localities in economic distress—mainly in the nation's central cities but also in impoverished rural areas, where there is an undue concentration of low-income groups, where high unemployment persists, and where there is a clear and urgent need for better education of the young. *The Task Force thus urges that federal attention and assistance go to depressed localities that have concentrations of immigrant and/or impoverished groups as well as those that are already making strong efforts to improve their education performance.* Quantitative measures of needs are available, grants can be flexible, and targets can be specific.

Educational Research

Proponents of the cabinet-level Department of Education predicted that its establishment would provide federal leadership for the public schools. Since it was set up, that prophecy has not been fulfilled, partly because initially the department had to take responsibility for a set of questionable and intrusive policies, partly because its role was downgraded with the change of administrations. This Task Force did not spend much time examining the function and performance of the Department of Education. Some members took the position that it was largely irrelevant; others thought that it would be better to restore it to a restructured Department of Health and Human Services, which might give it a stronger political influence; still others believed that its activities should be split up among various federal agencies.

But in the course of our deliberations, we had many opportunities to appreciate the value of the department's information and analysis on the state of our public schools. It does not seem necessary to keep the Department of Education in being simply because it has responsibility for information gathering and research, but federal responsibility for those activities ought to be maintained. Federal agencies have long had experience in the field and are superbly situated for collating data from the states. Whatever the fate of the department, we urge that the collection of data remain a federal responsibility.

Ever since it was established in 1867, the federal Office (now Department) of Education has gathered such basic data as the average number of pupils in daily attendance in the nation's schools, the number of teachers and other school employees, and the cost of educational services. More recently, the federal government has undertaken broad surveys of school practices, pupil performance, and the consequences of schooling for adult life. It has also funded the development of new curricula, studies of the effects of various educational innovations, and basic research on the processes of human learning. Currently, two agencies of the Department of Education bear much of this responsibility for research—the National Center for Education Statistics gathers information and data, and the National Institute of Education supports research and development. (Other federal agencies, such as the Census Bureau and the National Science Foundation, along with private foundations, also sponsor education research.) The results of data collection and research have proven useful in identifying areas of progress or emerging difficulties; sometimes they have pointed toward possible solutions; and sometimes they have served to focus the national debate on the schools.

Research on questions of educational quality can have symbolic as well as substantive value. For example, the study of the effects of school segregation undertaken by James Coleman for the Office of Education in 1965 focused public attention on the perniciousness of racism. Subsequent studies stimulated and informed public debate over such critical questions as the effects of school desegregation on "white flight," the results of compensatory education programs, and the relative merits of public and private schools. Current national concern with the quality of public education, particularly at the high school level, has been stimulated in part by findings of such federally sponsored projects as the National Assessment of Educational Progress.

The Task Force recommends federal support for a number of specific activities:

- The collection of factual information about various aspects of the education system itself. Such data gathering is traditional, uncontroversial, and essential if policies are to be developed on the basis of accurate information. Because collecting this information seems so routine, and because it has no particular "constituency," it is often starved for resources and is always vulnerable to the government's periodic efforts to "reduce paperwork." We urge that collection of this information be made mandatory.

- The collection of information about the educational performance of students, teachers, and schools across the nation. Although the National Assessment of Educational Progress has done useful work, and should be continued and strengthened, current federal efforts to appraise the quality of American education are inadequate. We urge the federal government, for example, to collect and disseminate information available from routine tests. Nearly every elementary school student regularly takes tests of performance and achievement in various skills and subjects, many of them prepared by private agencies and administered by school systems. The majority of states require high school students to take "competency" tests; college-bound students take a battery of tests developed by the Educational Testing Service and the American College Testing Service. All of this data should be collected and made accessible to researchers.

Other information would be useful too. In addition to knowing how many high school juniors are "taking mathematics," for example, it would be enlightening to know how many years of mathematics they have previously taken, what their courses have covered, and what kind of training and qualifications their teachers possess.

- Evaluation of federally sponsored education programs. Most federal education programs have some form of built-in evaluation, but all too often these are superficial, self-serving, or (especially when the results are critical) not readily accessible. A good rule of thumb, the Task Force believes, is that whenever the federal government conducts an educational program, whether it is a simple transfer of resources to college students or an attempt to foster a major pedagogical change in elementary schools, a "report card" on the effectiveness of that program should be made public.

- Fundamental research into the learning process. The more that is known about how youngsters learn, the better they can be taught. Learning is an immensely complicated affair, and progress has been made on it in recent years, partly with federal support. But the federal government spends a pittance on such research compared with its support for basic research into health, agriculture, the physical sciences, and weaponry. More money is needed, enough to enlist able scholars in the process—as designers of research agendas, as researchers, as "peer reviewers" of research proposals, and as evaluators of research findings.

Unfortunately, the National Institute of Education and other federal agencies have too often allowed their interests and resources to be diverted into peripheral topics, into fruitless quests for "quick fixes," or into catering to particular educational interest groups. So if the federal government is to be given primary responsibility for educational research, it must adopt sensible ground rules and safeguards to assure that its research is sound and comprehensive, and it must be supported in these efforts through the political process.

Provision of Choice

Although elementary and, to a considerable extent, secondary education in the United States is compulsory, it does not have to be public school education. American parents, who traditionally have insisted on a say in their children's schooling, can turn to private schools when they are not satisfied with public schooling—and some 10 percent of the school-age population attends private schools today. But the vast majority of children attend public schools, and it is critical that their parents be able to influence the quality of schooling.

Public schools are governed by local school boards, whose members in most districts are elected and are generally responsive to the parent-teacher associations (PTAs) whose members helped elect them. In many districts, PTAs or comparable parent groups play a constructive role, raising extra money for the schools and building community support for them. That role is a rarity in many urban districts, where community spirit is often lacking and where local schools are subject to the directives of higher authorities, who are frequently insensitive to community concerns.

The major choice available to parents opting for the public school system is their selection of a community in which to live. In large metropolitan areas subdivided into numerous small- to medium-sized suburbs, parents have a great deal of choice among many different—and different quality—public schools. A significant measure of the market value of a house is the prevailing opinion on the quality of the schools where it is located.

The biggest drawback to these options is the cost to the family. To send a child to a good public school often means paying more for a house or apartment. Private school tuition is extremely costly and must be paid over and above the taxes paid for local public schools. Family income thus limits choice. Only 4.8 percent of the nonpublic elementary school population came from families with incomes of less than $5,000 a year, compared with the 13.2 percent of the public school population. At the other end of the scale, 18.2 percent of elementary nonpublic school pupils came from families with incomes of $25,000 or more, compared with only 8.9 percent of public school pupils.

Many proposals have been made in recent years to give parents more of a voice in choosing where their children are educated. Among them are tax credit plans and tuition vouchers. The Task Force does not endorse such proposals or recommend a major redefinition of the relationship between public and nonpublic schools. We believe that the provision of free public education must continue to be a public responsibility of high priority, while support of nonpublic education should remain a private obligation. Yet we recognize that some children have not been able to learn in the present setting of public education. We cannot ignore, for example, students who repeatedly fail city or state competency examinations or fail in other ways to attain their academic capacity. Rather than having such students either held back time and time again or promoted year after year to new levels of remediation, *the Task Force recommends the establishment of special federal fellowships for them, which would be awarded to school districts to encourage the creation of small, individualized programs staffed by certified teachers and run as small-scale academies.** Eligibility for these fellowships, available to no more than 5 percent of public school enrollment, should be jointly determined by local, state, and federal school officials. Such an experiment, designed to benefit those who have been unable to learn in public schools, might provide the intensive and encouraging environment that these students need, and would free up the substantial resources now being spent on remediation with so little to show for it.**

**Comment by Mr. Denny*: I fully support the position taken by the Task Force on the provision of choice and our position not to support such ideas as tax credit plans and tuition vouchers. I also support the recommendation for the establishment of special federal fellowships for students who cannot learn in the present setting of public education. But I would also like such a fellowship program to offer support for especially able students who live in school districts where quality educational opportunities do not exist in the public schools. Such a program should follow the recommendation of the Task Force in providing fellowships to public school districts to encourage the creation of programs staffed by certified teachers and run as small-scale academies.

***Comment by Ms. Graham*: Although I agree with this proposal because it has much potential merit, I want to point out the danger that such a program could lead to resegregation without significant remediation.

Comment by Mr. Finn: This fellowship proposal is a variation on the idea that has sometimes been called "literary vouchers," an idea that I find interesting and potentially worthwhile for those youngsters having the least success in ordi-

Leadership in Education

While the federal role in promoting equality of opportunity and educational quality in the nation's schools is significant, elementary and secondary education in the United States must primarily remain a responsibility of state and local governments. A state-supported, locally administered system of public schools has successfully survived numerous challenges for more than one hundred years. By and large, this decentralized system of education has served more pupils, has provided a broader range of services, has proved more flexible in response to changing conditions, and has moderated class and group antagonisms more successfully than have the school systems of most other industrial nations.

But even though state and local governments should continue to bear the major responsibility for the provision of educational services, it is increasingly important that the federal government emphasize the pressing need for a high-quality system of education open to all Americans, regardless of race or economic position. Toward this end, the

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(Continued from page 18)
nary public schools. As formulated by the Task Force, however, it makes little or no use of the remarkable educational resource already present in some 18,000 private schools in the United States. Moreover, it cannot fairly be regarded as a substitute for or an alternative to various plans that have been advanced to assist those who would like to send their children to private schools but cannot afford to do so. While welcoming the Task Force's general endorsement of the principle of educational choice, I deeply regret the unwillingness of my colleagues to regard the nongovernmental schools already attended by one child in ten as a full and legitimate element of the nation's educational enterprise and as a particularly important resource in achieving the Task Force's vigorously stated goal of improved educational quality.

Comment by Ms. Yalow: I do not support a fellowship or tuition scholarship program for either the gifted or educationally retarded student. There are few schools or school districts, particularly in urban or suburban regions, which are so small as to make impracticable the setting aside of special classes for each of these groups. I believe the mixing in the same class of students with vastly differing abilities in the name of equality has been a retrogressive step. All students cannot learn at the same rate or acquire the same degree of competency. There is no a priori reason why a public school cannot provide a learning environment equal to that of a private school. Segregation according to ability as previously was done would assure each child an opportunity to develop in accordance with that ability. The fact that parents are turning to private schools is a measure of the inadequacy of public schools. Any available funding should go to support of special programs in the public school system and not to removing students from that system.

Task Force has put forward a coordinated policy of overall federal support for American schools that simultaneously asserts the national interest in quality schools and in equal access to education, with assistance for those with special needs.

To attain improvement in quality, we have proposed a number of new programs designed to strengthen teaching in curricular areas where national needs are especially great. To spur equal access to education, we recommend that current programs for special-needs students be supplemented by programs that will support school districts with large numbers of poor and immigrant pupils as well as districts that are experiencing fiscal difficulties. In addition, we have recommended that federal funding be provided to local school districts as an incentive to encourage new ways to help failing students.

In all of these programs, it must be kept in mind that equality of educational opportunity cannot be separated from educational quality. The nation is best served by offering our young people the most rigorous educational experience that we can. The federal government has a responsibility to help overcome the unevenness of state efforts. It will have to provide compensatory assistance, for some time to come, to those who are in need of special help, especially for students who must achieve English-language proficiency. But that does not mean abandoning a single standard of excellence. There cannot be a white standard or a black standard or a Hispanic standard when measuring educational performance.

The Task Force is aware that some of its proposals are costly. But we should be able to afford the price of a commitment to educational excellence. This nation's young people are our most precious and potentially our most productive asset, provided that we invest wisely in educating them. In our view, support for our program by Congress and the White House will demonstrate the value that they attach to better schooling for all.

Our proposed new approach for federal education policy will, we believe, stimulate a national reawakening of interest in educational excellence. But carrying out this policy requires our nation's political leaders to take an active part in supporting needed programs. It is no longer a cause that requires political courage. All across the country parents are demanding more of the schools, and in many cases the schools are already responding. We think the time is past due to offer a better education to all Americans. What it takes now is the political will to bring it about.

ACTION FOR EXCELLENCE

A Comprehensive Plan to Improve Our Nation's Schools

from

Task Force on Education for Economic Growth

Education Commission of the States

June 1983

Education Commission of the States

The Education Commission of the States is a nonprofit, nationwide interstate compact formed in 1966. The primary purpose of the Commission is to help governors, state legislators, state education officials and others develop policies to improve the quality of education at all levels. Forty-eight states, American Samoa, Puerto Rico and the Virgin Islands are members. The ECS central offices are at 1860 Lincoln Street, Suite 300, Denver, Colorado 80295. The Washington office is in the Hall of the States, 444 North Capitol Street NW, Suite 248, Washington, D.C. 20001

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FOREWORD: A CONVICTION THAT A REAL EMERGENCY IS UPON US

This action plan from the National Task Force on Education for Economic Growth differs from other national commission reports in several important ways:

- **It is put forth with an unusual sense of urgency.** There are few national efforts that can legitimately be called crucial to our national survival. Improving education in America — improving it sufficiently and improving it now — is such an effort. Our purpose is to reach as many citizens as possible and to persuade them to act. The facts on education and achievement in America have recently been gathered and presented by many different groups. What is needed now is to act on those facts.

- **It calls for action by the states and by local communities.** We acknowledge the importance of a strong Federal commitment to education — and we believe that commitment must be backed by sufficient resources. In this report, however, we have chosen to focus on action at the state and local level, and to call for new commitment and new action from the states and communities of America. We do so because it is here that the chief responsibility for education lies. Education for economic growth is indeed a national challenge, and it justifies national leadership and a national response. But important national commitments, in our judgment, do not only trickle down; they also bubble up.

- **This report concentrates on the nation's public schools and on the years from kindergarten through twelfth grade.** Our national system includes much more: the private schools, our colleges and universities, proprietary job-training schools and corporate training programs, to name only a few. We believe, however, that the public schools are the key component of the system, and that clarity is gained by focusing our deliberations and our recommendations.

- **This report calls for new alliances among educators, school systems and many other groups in America to create a new ethic of excellence in public education.** We believe especially that businesses, in their role as employers, should be much more deeply involved in the process of setting goals for education in America and in helping our schools to reach those goals. And we believe that legislators, labor leaders, parents, and institutions of higher learning, among others, should be far more involved with the public schools than they are at present.

■ **This report calls not for quick fixes, but for deep and lasting change.** Much of what we recommend is ambitious and will be politically demanding, for it involves fundamental changes in the priority we Americans put on education; changes in the way we run our schools; changes in the ways that we train, recruit and pay teachers and administrators, and changes in the very goals we set for public education in America.

■ **Finally, this report represents the midpoint — not the end — of our work.** Rather than disband with the publication of our report, the Task Force plans to remain busy. We will actively promote efforts to put this action plan into effect. We will use our resources and our personal energies to drive home the need for better education in the cause of a more prosperous and productive nation. And we will establish a clearinghouse of information and ideas for states and communities working to improve their schools.

The National Task Force on Education for Economic Growth comprises a wide range of leaders: governors, legislators, corporate chief executives, state and local school board members, educators, leaders of labor, the scientific community and many others. They are a diverse and occasionally contentious group, representing various interests and constituencies. But over several months of deliberations, these leaders from many different enterprises have been united by three strong, shared convictions: a conviction that a real emergency is upon us; a conviction that we must *act* now, individually and together; and a passionate, optimistic conviction that action, soon enough and in the right directions, can succeed.

We will be successful because of the good work that is already being done by dedicated people and because of the overwhelming power of our people to act to improve our nation's future.

James B. Hunt, Jr.
Governor of North Carolina
Chairman

Pierre S. du Pont, IV
Governor of Delaware
Co-Chairman

Frank T. Cary
Chairman of the Executive Committee,
IBM Corporation
Co-Chairman

EXECUTIVE SUMMARY: THE ACTION PLAN

Convinced that continued progress in American education is vital to our national survival, the **Task Force on Education for Economic Growth** has prepared an action plan that outlines the new skills students will need to meet the demands of a rapidly changing workplace, summarizes the problems we face in revamping our educational system, makes eight major recommendations for action, and follows each recommendation with steps that various groups can take to improve education. The outlook is bright: great as some of the difficulties confronting education may be, our assets are greater still.

The action plan marks the midpoint in the work of the Task Force, a partnership of government, business, labor and education leaders who will continue their efforts to promote lasting change in education over the next year.

THE CHALLENGE: New Skills for a New Age

Technological change and global competition make it imperative to equip students in public schools with skills that go beyond the "basics." For productive participation in a society that depends ever more heavily on technology, students will need more than minimum competence in reading, writing, mathematics, science, reasoning, the use of computers, and other areas. Mobilizing the education system to teach new skills, so that new generations reach the high general level of education on which sustained economic growth depends, will require new partnerships among all those who have a stake in education and economic growth. The challenge is not simply to better educate our elite, but to raise both the floor and ceiling of achievement in America.

THE PROBLEM: Educational Deficits and Blurred Goals

Education for economic growth demands progress on many fronts. Students need to improve their performance, particularly their mastery of higher order skills. Relieving the shortage of teachers at the point where quality and quantity intersect may require new strategies. So may strengthening the curriculum and improving the management of schools so principals can concentrate on academic matters. Inhibiting progress is the lack of clear consensus about how to improve education, especially since some prevailing policies (like lowered standards for college entrance and lessened emphasis on homework) work against excellence in education.

THE RESPONSE: Recommendations of the Task Force

ACTION RECOMMENDATION 1

Develop — and put into effect as promptly as possible — state plans for improving education in the public schools from kindergarten through grade 12.

- Led by the governor, each state should develop a state plan for education and economic growth.
- Each governor should appoint a broadly inclusive state task force on education for economic growth.
- Each school district should develop its own plan.

ACTION RECOMMENDATION 2

Create broader and more effective partnerships for improving education in the states and communities of the nation.

- Business leaders, labor leaders, and members of the professions should become more active in education.
- Business leaders should establish partnerships with schools.
- Governors, legislators, chief state school officers, state and local boards of education, and leaders in higher education should establish partnerships of their own.

ACTION RECOMMENDATION 3

Marshal the resources which are essential for improving the public schools.

- School systems should enrich academic programs and improve management to make the best possible use of resources.
- States and communities should invest more financial, human and institutional resources in education.
- The federal government should continue to support education.

ACTION RECOMMENDATION 4

Express a new and higher regard for teachers.

- States and school districts — with full participation by teachers — should dramatically improve methods for recruiting, training, and paying teachers.
- States should create "career ladders" for teachers.
- States, communities, the media and the business community should devise new ways to honor teachers.

ACTION RECOMMENDATION 5

Make the academic experience more intense and more productive.

- States and school systems should establish firm, explicit, and demanding requirements concerning discipline, attendance, homework, grades, and other essentials of effective schooling.

- States and school systems should strengthen the public school curriculum.
- States should increase the duration and the intensity of academic learning.

ACTION RECOMMENDATION 6

Provide quality assurance in education.

- Boards of education and higher education should cooperate with teachers and administrators on systems for measuring the effectiveness of teachers and rewarding outstanding performance.
- States, with full cooperation by teachers, should improve the process for certifying teachers and administrators and make it possible for qualified outsiders to serve in the schools.
- States should examine and tighten procedures for deciding which teachers to retain and which to dismiss.
- Student progress should be measured through periodic tests of general achievement and specific skills; promotion from grade to grade should be based on mastery, not age.
- States and communities should identify clearly the skills they expect the schools to impart.
- Colleges and universities should raise their entrance requirements.

ACTION RECOMMENDATION 7

Improve leadership and management in the schools.

- Principals should be squarely in charge of educational quality.
- Pay for principals should relate to responsibilities and effectiveness.
- States should set higher standards for recruiting, training and monitoring the performance of principals.
- Schools should use more effective management techniques.

ACTION RECOMMENDATION 8

Serve better those students who are now unserved or underserved.

- States and school districts should increase the participation of young women and minorities in courses where they are under-represented.
- States should continue to develop equitable finance measures to insure that education resources are distributed fairly.
- States and school systems should identify and challenge academically gifted students.
- States, school systems, principals, teachers, and parents should work to reduce student absences and failures to finish school.
- States and school systems should specifically include handicapped students in programs for education and economic growth.

THE OUTLOOK: Can We Succeed?

We can improve public education across the nation. Our resources are abundant. Our commitment to a broadly inclusive educational system has been demonstrated by the impressive reforms of the 1970s. And the substantial progress states and communities have already made in improving the quality of education is proof positive that we can indeed change education in deep and lasting ways. But the stakes are high, and our ultimate success will depend in large measure on our willingness to act. No task facing our nation matters more than to launch — now — the action plan set forth here.

EDUCATING AMERICANS FOR THE 21st CENTURY:

A plan of action for improving mathematics, science and technology education for all American elementary and secondary students so that their achievement is the best in the world by 1995

A REPORT TO THE AMERICAN PEOPLE
AND THE NATIONAL SCIENCE BOARD

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THE NATIONAL SCIENCE BOARD COMMISSION ON PRECOLLEGE
EDUCATION IN MATHEMATICS, SCIENCE AND TECHNOLOGY

NATIONAL SCIENCE BOARD
NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

NSB COMMISSION ON PRECOLLEGE
EDUCATION IN MATHEMATICS,
SCIENCE AND TECHNOLOGY

September 12, 1983

Dr. Lewis M. Branscomb
Chairman
National Science Board
National Science Foundation
Washington, D.C. 20550

Dear Dr. Branscomb:

It is a pleasure to transmit to you the Commission's final report. This Commission does not simply decry the present inadequate state of many of the Nation's schools. Rather, we spell out a detailed plan of action for all sectors of society to address the very serious problems facing America's elementary and secondary educational systems in mathematics, science and technology. Many of our recommendations focus primarily on these fields; however, many apply equally well to other areas of study—literature, foreign languages, social science, history, art, etc. Thus, we hope this Report is disseminated widely.

The plan of action in this Report is directed toward the Nation's achieving world educational leadership (as measured by student achievement and participation levels and other non-subjective criteria) in mathematics, science and technology in elementary and secondary schools by the year 1995. Moreover, in keeping with the goals the Commission adopted at its first meeting in July 1982, the recommendations are intended not only to increase opportunities for outstanding students in these fields, but also to enrich the educational experiences of the entire range of American students—those planning careers as professional mathematicians, scientists, engineers and teachers in these fields, those who will pursue technical careers, and those who will be the Nation's future political leaders, managers, laborers, parents, consumers and voters. The Commission believes America's educational systems must provide opportunities and high standards of excellence for all our youth because the Nation's national security, economic strength and quality of life depend on the mathematics, science and technology literacy of all its citizens.

The Commission has visited and analyzed acknowledged examples of successful programs and received testimony from a very wide range of individuals and groups. The exhibits in this volume summarize much of the Commission's work. In addition, the volume of source materials accompanying this Report reproduces many of the reports commissioned explicity to inform our deliberations.

The Report estimates the costs to the Federal government of the new programs we suggest it should adopt. The Federal cost recommended is $1.51 billion for the first year the Commission's recommendations are in effect (but Federal disbursement would not exceed $956 million in any year). The Report also suggests a procedure to ascertain the other, additional costs for the Nation—at Federal, state and local levels—to provide the kind and quality of education which the Commission deems necessary for successful living in the 21st century. The Commission believes the serious problems facing America's elementary and secondary educational systems in mathematics, science and technology can be solved. The job can be done. There are now numerous pockets of academic excellence throughout the United States. But raising the entire system to a new standard of excellence will require that these exceptions become the norm. This can only be accomplished through leadership from the President, Governors and leaders of local school boards, and by concerted and sustained actions throughout the Nation. We hope our Report will provide some guidance and inspiration to those who will lead the effort and those who must carry it to fruition.

The members of the Commission thank you for the opportunity to serve.

Sincerely,

William T. Coleman, Jr.
William T. Coleman, Jr.
Co-Chair

Cecily C. Selby
Cecily Cannan Selby
Co-Chair

EXECUTIVE SUMMARY

September 12, 1983

AN URGENT MESSAGE TO PARENTS, DECISION MAKERS AND ALL OTHER AMERICANS

The Nation that dramatically and boldly led the world into the age of technology is failing to provide its own children with the intellectual tools needed for the 21st century.

We continue to lead because our best students are still unsurpassed. We continue to lead because our universities, industries, resources and affluence attract the finest talent from throughout the world. But this is a precarious advantage. The world is changing fast. Technological know-how is spreading throughout the world—along with the knowledge that such skills and sophistication are the basic capital of tomorrow's society.

Already the quality of our manufactured products, the viability of our trade, our leadership in research and development, and our standards of living are strongly challenged. Our children could be stragglers in a world of technology. We must not let this happen; America must not become an industrial dinosaur. We must not provide our children a 1960s education for a 21st century world.

We must return to basics, but the "basics" of the 21st century are not only reading, writing and arithmetic. They include communication and higher problem-solving skills, and scientific and technological literacy—the *thinking* tools that allow us to understand the technological world around us.

These new basics are needed by *all* students—not only tomorrow's scientists—not only the talented and fortunate—not only the few for whom excellence is a social and economic tradition. All students need a firm grounding in mathematics, science and technology. What follows is a difficult and demanding plan to achieve this, but it must be accomplished. Our children are the most important asset of our country; they deserve at least the heritage that was passed to us.

- By 1995, the Nation must provide, for all its youth, a level of mathematics, science and technology education that is the finest in the world, without sacrificing the American birthright of personal choice, equity and opportunity.

This goal can be achieved. The best American students are the equal of any in the world. Indeed, the best schools in the world emulate the best of America. We have the know-how.

The Commission proposes sweeping and drastic change: in the breadth of student participation, in our methods and quality of teaching, in the preparation and motivation of our children, in the content of our courses, and in our standards of achievement. We propose to initiate this difficult change through a strategy of (1) building a strong and lasting national commitment to quality mathematics, science and technology education for all students; (2) providing earlier and increased exposure to these fields; (3) providing a system for measuring student achievement and participation; (4) retraining current teachers, retaining excellent teachers and attracting new teachers of the highest quality and the strongest commitment; (5) improving the quality and usefulness of the courses that are taught; (6) establishing exemplary programs—landmarks of excellence—in every community to foster a new standard of academic excellence; (7) utilizing all available resources, including the new information technologies and informal education; and (8) establishing a procedure to determine the costs of required improvements and how to pay for them.

In this Report we emphasize the teaching and learning of mathematics, science and technology in elementary and secondary schools; that is the Commission's charge. We recognize, however, that this area cannot be separated from the teaching and learning of many other important subjects, such as English, foreign languages and history. We hope that glaring deficiencies in these other areas will be met with the same sense of urgency. (pp. 6, 10)

Leadership

Reaching a new standard of academic excellence by 1995 requires clear educational objectives, strong leadership and firm commitment at all levels. Goals must be set and progress toward those goals assessed. We must recognize the necessary investment, assess the cost, and accept the responsibility for participation at Federal, state and local levels, in both the public and private sectors. We call upon our national leaders to begin and maintain the process. (pp. 9–12)

- The President should immediately appoint a National Education Council, reporting directly to him, to identify national educational goals, to recommend and monitor the plan of action, to ensure that participation and progress are measured, and to report regularly to the American people on the standards and achievements of their schools.
- The States should establish Governors' Councils to stimulate change, develop state educational goals, and monitor progress.
- Local school boards should foster partnerships with business, government and academia to encourage, aid and support in solving the academic and financial problems of their schools.
- The Federal government should finance and maintain a national mechanism for measuring student achievement and participation in a manner that allows national, state and local evaluation and comparison of educational progress.

Focus on All Students

This Commission's plan is not only for the affluent or gifted. While it provides the quality and intensity of education needed to continue their development, it also addresses the needs and potential of all other students. It recognizes that substantial portions of our population still suffer from the consequences of racial, social and economic discrimination, compounded by watered standards, "social promotion," poor guidance and token efforts. The Commission has found that virtually every child can develop an understanding of mathematics, science and technology if appropriately and skillfully introduced at the elementary, middle and secondary levels. (pp. 12–14)

- The Nation should reaffirm its commitment to full opportunity and full achievement by all. Discrimination, and the lingering effects thereof, due to race, gender and other such irrelevant factors must be eradicated completely from the American educational system. "Excellence and elitism are not synonomous."

Quality Teaching and Earlier and Increased Exposure

Here and in other countries, programs that produce excellence and high achievement have similar characteristics. Education in mathematics, science and technology begins early, is taught by qualified, committed teachers, and provides a consistent course of study, beginning before elementary school and continuing in a coherent pattern through high school. (pp. 17–23)

This "vertical" curriculum emphasizes early "hands-on" experience, disciplined and rigorous study, and a substantial amount of time-on-task and homework at all levels. Above all, it includes strong motivation and commitment. Parents, students and the system are all dedicated to high achievement from every student. Finally, successful systems have skilled and well trained teachers who are supported by skilled administrators, good facilities and specialized assistance. (pp. 17–25)

This is true of major competitors like Japan, and it is true of America's scattered but equally impressive model programs. Unfortunately, it is not true of most of our schools. (pp. 17–21)

- Top priority must be placed on retraining, obtaining and retaining teachers of high quality in mathematics, science and technology, and providing them with a work environment in which they can be effective.
- Top priority must be placed on providing earlier, increased and more effective instruction in mathematics, science and technology in grades K-6.
- Considerably more time should be devoted to mathematics, science and technology throughout the elementary and secondary grades. This will require that the school day, week and/or year be substantially lengthened.

Models for Change

The potential of exemplary or model programs has been demonstrated in cities and localities throughout the country. Typically, they exhibit high achievement from students of every background, have strong links to local resources, and set an example that should be emulated and replicated in every school. As a first step toward change we recommend that such landmarks of excellence for mathematics, science and technology education be established in every community. (pp. 23–25)

- The Federal government should encourage and finance, in part, the establishment of exemplary programs in mathematics, science and technology in every community, which would serve as examples and catalysts for upgrading all schools.
- State governments should promote and local school districts should establish such programs as a major strategy toward upgrading all schools.

We recommend that initially 1,000 such secondary schools and 1,000 such elementary schools be established throughout the country. The Commission estimates the cost to the Federal government to do so is $829 million disbursed at the rate of $276 million per year over a three year period. (p. 25 and Exhibit C, p. 109)

Solutions to the Teaching Dilemma

Ultimately, quality begins in the classroom; the teacher is the key. Unfortunately, we currently have severe shortages of qualified mathematics, science and technology teachers throughout the Nation, and many of today's teachers in these fields badly need retraining.

Many of the teachers in elementary schools are not qualified to teach mathematics and science for even 30 minutes a day. A significant fraction of our secondary school teachers are called upon to work in subjects for which they were never trained. Even the most seasoned and experienced veterans must deal with subjects that are in a state of constant change; no one can remain knowledgeable in science without constant refreshing. (pp. 27–31)

- State governments should develop teacher training and retraining programs in cooperation with colleges and universities. The potential of science museums as sites for such programs should be recognized, encouraged and supported.
- It is a Federal responsibility to assure that, in the present crisis, appropriate retraining is available. In-service and summer training programs should be established with Federal support. The Commission estimates the cost to the Federal government of initiatives for retraining mathematics, science and technology teachers to be $349 million per year for five years. (Exhibit C, p. 110)
- For the long term, teacher training by the States should continue as an ongoing process.
- Every State should establish at least one regional training and resource center where teachers can obtain supporting services such as computer instruction and software and curriculum evaluation.
- The National Science Foundation should provide seed money to develop training programs using the new information technologies.

At the same time that we improve the quality of current teaching, we must raise our standards for new teachers. We must attract and retain superior talent, and must provide better training, better working conditions, and better compensation for high quality teachers, together with more demanding standards. (pp. 31–33)

- States should adopt rigorous certification standards, but not standards which create artificial bars to entry of qualified individuals into teaching.
- Elementary mathematics and science teachers should have a strong liberal arts background, college training in mathematics and the biological and physical sciences, a limited number of effective education courses, and practice teaching under a qualified teacher.
- Secondary school mathematics and science teachers should have a full major in college mathematics and science, a limited number of effective education courses, and practice teaching under a qualified teacher.
- Both elementary and secondary teachers should be computer literate. Teacher training should incorporate the use of calculators and computers in mathematics and science instruction.
- Liberal arts colleges and academic departments need to assume a much greater role in training elementary and secondary teachers. Basic education courses should be revised to incorporate current findings in the behavioral and social sciences.

In the short run, the pool of those presently qualified and teaching must be enlarged.

- State and local school systems should draw upon the staffs of industry, universities, the military and other government departments, and retired scientists to provide sources of qualified teaching assistance. Local systems should take actions to facilitate the entry and classroom training of such special teachers.

Compensation for mathematics, science and technology teachers must be appropriate to their important role in "academic excellence," their small numbers, and their alternatives for employment. Highly qualified and competent mathematics, science and technology teachers should receive overall rewards that are fair and relatively competitive with those received by comparable professionals in other sectors. Ultimately, the public will get what it pays for. At the same time, many teachers and teacher unions will have to reexamine their views about differential salaries in areas of shortage and systems of pay based on factors other than merely years of service and credits for "staff development." (pp. 33–35) Examples of imaginative ways to enhance teacher compensation are provided in Exhibit D.

- School systems should explore means to adjust compensation in order to compete for and retain high quality teachers in fields like mathematics, science and technology. Compensation calculations must include consideration of intangible benefits such as the length of the work year, promotion potential, and similar factors.

- State and local governments should provide means for teachers to move up a salary and status ladder without leaving the classroom.
- Local school systems, military and other governmental entities, and the private sector should all explore ways to extend the employment year while providing supplementary income and revitalizing experience.
- Professional societies, schools, States and the Nation should find ways to recognize the performance and value of the excellent teacher.

Finally, we must take action to make the classroom a place where teachers can teach and children can learn—an exciting place with more opportunity for student-teacher interaction. We must build a professional environment that will attract and hold talented and well trained teachers, despite the allure of the private sector. (pp. 35–37)

- State and local governments should work to improve the teaching environment. This includes greater administrative and parental support of discipline and attendance, fewer classroom interruptions, and higher academic standards, as well as the provision of needed equipment, materials and specialized support staff.

Improving What is Taught and Learned

We have too long regarded mathematics and science as the exclusive domain of a talented elite—a preserve for only the gifted. By focusing on education of the well-prepared, we have both ignored and discouraged large numbers with potential talent and widened the gap between the sciences and the public they serve. There is no excuse for citizens in our technological society to say "I don't really know anything about science!"

While increasing our concern for the most talented, we must now also attend to the need for early and sustained stimulation and preparation of *all* students so that we do not unwittingly exclude potential talent and so that we produce citizens, political leaders, teachers, managers, workers and other decision makers who are prepared to deal with the age of technology. Significant, immediate progress can be made by simply increasing the amount of exposure students get to mathematics, science and technology—although more persistent change will require a more elaborate process of review and revision of educational objectives. (pp. 39–41)

- Local school districts should revise their elementary school schedules to provide consistent and sustained attention to mathematics, science and technology: a minimum of 60 minutes per day of mathematics and 30 minutes per day of science in grades K-6; a full year of mathematics and science in grades 7 and 8.
- Every State should establish rigorous standards for high school graduation, and local school districts should provide rigorous standards for grade promotion. We should curtail the process of social promotion.

- All secondary school students should be required to take at least three years of mathematics and of science and technology, including one year of algebra and one semester of computer science. All secondary schools should offer advanced mathematics and science courses. This requirement should be in place by September 1, 1985.
- Colleges and universities should phase in higher mathematics and science entrance requirements, including four years of high school mathematics, including a second year of algebra, coursework covering probability and statistics, four years of high school science, including physics and chemistry, and one semester of computer science.
- Specific school personnel should be obligated to inform students of these rigorous requirements. School districts and community colleges should cooperate in assisting students whose preparation is inadequate to allow them to take the next steps in their education.

For the long term, we must establish a pattern of education that will develop familiarity, skills and understanding consistently and coherently throughout the years of elementary and secondary education. This does not imply either a lockstep or "national" curriculum; local diversity and variation is a key strength of American education. Rather, we call for a consensus on new educational objectives and a coherent national *pattern*—a framework for consistent education within which alternative curricula and materials and local interpretation are encouraged. (pp. 45–48)

- The National Science Foundation should take a leadership role in promoting curriculum evaluation and development for mathematics, science and technology. It should work closely with classroom teachers, technical experts from business and government, school boards and educational researchers, as well as with professional societies. Representatives of publishers and higher education associations should become involved as the work proceeds, to encourage development and transfer of these ideas to actual material for the classroom.
- The Federal government should support research into the processes of teaching and learning at both the basic level and the level of classroom application.

In the body of this Report, we provide a broad and preliminary outline of the content that should be included in this new pattern of education for all students. More importantly, we indicate the kinds of problem solving *insight* and *skills* that must be provided. We offer this not as a conclusion, but as a beginning—a place to start the long process of defining and developing programs that prepare students for a wide range of roles and needs. (pp. 41–45 and Exhibit B)

New Information Technologies

Computers are revolutionizing many areas of our lives; they may well do the same for education. They and other new technologies offer the potential to work patiently with every student, regardless of level or sophistication. They also offer a means to relieve teachers of much of the drudgery of routine exercise and record keeping. Furthermore, computers offer a wealth of interactive learning resources, including access to word processing, data bases, graphic capabilities and a host of related means to expand students' learning potential.

If this promise is fulfilled, computers could simultaneously provide a new standard of achievement and lower the cost of education. (pp. 51–56)

- The National Science Foundation should lead in evaluating progress in the application of new technologies, supporting prototype demonstrations, disseminating information, and supporting research on integration of educational technologies with the curriculum. These plans should not interfere with private initiatives now underway.
- States should establish regional computer centers for teacher education and encourage the use of computers in the classroom for both teaching and administration.
- Top executives in the computer, communication, and information retrieval and transfer industries should develop plans which, in a good, economical and quick way, enable school systems to use the technology.
- The national and state education councils and school boards should work with school districts and schools to develop plans for implementing these technologies in the classroom.

Informal Education

A great deal of education takes place outside the classroom. The most fortunate students receive experiences in museums, clubs and independent activities. All children are strongly conditioned and motivated by their early experiences and impressions. The child who has regularly visited zoos, planetaria and science museums, hiked along nature trails and built model airplanes and telescopes is infinitely better prepared for, and more receptive to, the mathematics and science of the classroom.

Formal education should be preceded and supplemented by a wide range of such informal learning experiences. (pp. 59–61)

- Youth organizations, museums, broadcasters and other agents of informal education should endeavor to make the environment for informal learning as rich as possible.
- Science broadcasts warrant continued and substantial Federal support as well as corporate and other private support. Federal regulation of commercial stations should include a required period of educational programming for children.
- The Federal government should provide supplementary support to encourage a full spectrum of community and educational activities by science museums.
- Businesses and broadcasters should help to promote and publicize the efforts of institutions like science museums and public broadcasting.

- Local business groups and organizations with related interests should work with museums to supplement and encourage their activities and to create new programs that let children see science and technology in the real world.

Finance

This Commission has not avoided the difficult issue of cost. Change requires investment. In the end, it may well be that a better educational system will yield greater efficiency, long-term economies and a more valuable output. But in the near future, our recommendations require substantial net investment at all levels.

In particular, as the leader and driving force to encourage change, we believe that the Federal government should anticipate an initial investment of approximately $1.51 billion for the first full year the recommended Federal initiatives are in place (pp. 63–66, and Exhibit C) ($829 million of this amount will be disbursed over three years at the rate of $276 million per year.) During succeeding years the Federal appropriation will decline—to approximately $680 million in the second year and $331 million in the sixth year. We do not consider this an excessive investment in our Nation's human capital. In fact, the cost is small compared to the much larger efforts and investments of local school systems, which ultimately carry most of the burden, responsibility and authority for the quality of our children's education. The Federal government should study ways to protect the States and local communities from any anti-competitive effects on the States and local communities of increasing taxes for educational purposes. (p. 66)

Before we shrink from our responsibility, consider the heritage that was passed to us. We must not do less for our children and future generations.

THE NATION RESPONDS

Recent Efforts to Improve Education

United States
Department of
Education

MAY 1984

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THE NATION RESPONDS: AN OVERVIEW

Americans will remember 1983. During that year, deep public concern about the Nation's future created a tidal wave of school reform which promises to renew American education. Citizens, perplexed about social, civic, and economic difficulties, turned to education as an anchor of hope for the future of their Nation and their children. Schools survived an unprecedented firestorm of critical comment and attention from the press to emerge at the end of the year with greater public support than at any time in the recent past.

1983 was the year in which:

- The ethic of excellence reasserted its strength as a beacon for American education and a measure of progress.
- Several major studies on American secondary schools appeared, some of them in preparation for years.
- Professional educators seized the opportunity to make improvements in school practice.
- Consensus developed over the imperative to close what Ernest L. Boyer, President of the Carnegie Foundation for the Advancement of Teaching, called "the alarming gap between school achievement and the task to be accomplished."
- The Nation's Governors exerted their leadership, and were supported by legislatures across the country in enacting and funding comprehensive school reform packages.
- Corporate leaders enlisted in the struggle to improve education.
- The American public, after years of dissatisfaction, reaffirmed its faith in American schools, listed education high among its concerns about the national agenda, and supported tax increases tied to improving educational quality.

Several of these developments were well underway before the National Commission issued its startling report *A Nation at Risk* in April 1983. The other significant analyses produced during the year also supported the reform movement.

Nevertheless, it remains true as the *New York Times* reported in June 1983 that the Commission "brought the issue [of education] to the forefront of political debate with an urgency not felt since the Soviet satellite shook American confidence in its public schools in 1957."

THE RESPONSE

The actions of individual institutions and governing structures—schools, colleges, local boards, Governors, and State legislatures—provide one measure of the response to the reports issued by the Commission and others. But this reform movement extends beyond specific schools and governing bodies to include the general public, the press and broadcast media, as well as the broad profession of education.

Public Response: Education has vaulted to the forefront of the national agenda, and the public acceptance of these reports is compelling evidence of their impact. Recent opinion polls confirm that the people know and understand the importance of education to the Nation's material well-being and their own future. They are indeed willing to act on the belief that education belongs at the top of the national agenda. For example:

- *Newsweek* reported in February that unemployment was the only issue ranked higher than education in its national survey of important issues in the 1984 Presidential campaign. Two-thirds of the voters surveyed cited the quality of public education as one of the most important issues—higher than inflation, relations with the U.S.S.R., protecting American jobs, or the Federal deficit.

- The National Conference of State Legislatures reported in October 1983 that education, along with crime and unemployment, ranks at the top of the Nation's domestic agenda. Unlike other issues, however, there is "almost total agreement" among all sections of the public on the fundamental value of education and what needs to be done to improve it.

- A fall 1983 poll by the Public Policy Analysis Service indicates intense support among all population groups for the proposition that the erosion of public education threatens "our future as a nation." Over 70 percent of those surveyed agreed.

- Two leading public opinion researchers, Robert M. Teeter and Peter Hart, agree with a May 1983 Gallup Poll indicating that American taxpayers will support increased funding for education, but only if quality is assured. The Gallup Poll indicated that 58 percent of the respondents would be willing to pay more taxes to help raise the standard of education in the United States.

- Even students appear to support the reports' findings. Last summer's delegates to the Annual Conference of the National Association of Student Councils overwhelmingly endorsed more rigorous standards, higher pay for teachers, higher standards for teacher candidates, and upgrading textbooks.

- Business and corporate leaders have also taken up the challenge. Many chambers of commerce, statewide Business Roundtables, and countless local business organizations have taken the lead in promoting corporate contributions to education, encouraging employee involvement with the schools, and in supporting legislative and budget support for educational reform.

- The public, represented by its elected officials, is willing to support reforms extending beyond the reports. Most of the analyses of the past year centered on the American high school, and several of them focused on mathematics and science. The enacted reforms are far more comprehensive, often including the entire school curriculum from kindergarten through grade 12.

A related development is equally significant: The National Parent Teacher Association (PTA) reports an increase of 70,000 members over the past year after a 20-year membership decline. This encouraging news indicates that members of the public are aware of their responsibilities as both citizens and parents.

This outpouring of support confirms the public's steadfast belief in education as one cornerstone of a satisfying life, a civil society, and a strong economy.

Press and Broadcast Media: The response of the press and broadcast media to this wave of reports has been remarkable, and goes beyond recording the existence of the reports and reaction to them. Editorials, political cartoons, and special features have illuminated the fundamental importance of education in a technologically advanced society dedicated to individual freedom and democratic values.

A Department of Education review of 45 different newspapers —including both national and local papers—identified over 700 articles related to *A Nation at Risk* in the 4 months following the report's release. Moreover, major periodicals, including *Time*, *Newsweek*, *The New Republic*, and *Better Homes and Gardens*, have devoted extensive space to commentary on the Commission and on educational issues.

In the last 8 months press attention to the issue of quality education has continued. Both national and local newspapers built on the initial excitement attending release of the Commission's report with in-depth articles on how local schools and school systems were attacking their problems.

The broadcast media's attention to the report occurred mostly in the spring and summer of 1983, although local stations, network, independent, and public, continue to feature educational issues.

Network television coverage of educational issues in the past 12 months has included: NBC's "Today Show," "Nightly News," "The McLaughlin Group," and "Meet the Press"; CBS' "Evening News," "Morning News," "Agronsky and Company," and "Phil Donohue Show"; and ABC's "World News Tonight," "Nightline," "Good Morning America," and "The David Brinkley Show;" and a PBS special on the American high school. In addition, cable television available to national audiences included two "Close-Up" shows on the C-SPAN Network.

The Education Profession: Of all the responses to the calls for reform, the reaction of the education profession and its national leadership is the most heartening. Laying aside individual disagreements about specifics, the profession has responded in the public interest. For example:

- In November 1983, the Forum of Educational Organization Leaders, representing schools of education, teachers' unions, chief state school officers, school boards, school principals, and parent-teacher associations, presented a joint response welcoming the reports and endorsing specific actions relating to curriculum, use of school time, testing and evaluation, and teaching.

- The Council for American Private Education has initiated a new effort to recognize outstanding private schools.

- The leaders of both the National Education Association and the American Federation of Teachers have participated actively in the debate about performance-based pay.

- Leaders of the Nation's schools of education are studying fundamental reforms in teacher preparation programs, and have created a broad-based Commission on Teacher Education.

- School officials in such cities as Boston and Atlanta are forging new alliances with the business community in an effort to improve education, and similar coalitions are springing up around the country between schools and colleges and universities.

- A review of leading professional journals, several of them published by education associations, indicates that between April 1983 and the fall over 100 articles appeared in response to the spate of reports, nearly one-half of these articles on teaching, but many of them on other areas of concern: curriculum content, expectations, time, and leadership and fiscal support.

Teachers, administrators, and other education professionals, in short, have seized on what Albert Shanker, President of the American Federation of Teachers, has described as an "unprecedented opportunity for education."

NATURE OF THE REFORM MOVEMENT

Of all the characteristics of the current reform movement, one in particular gives promise for significant long-lasting change: the comprehensive nature of the proposals. These efforts are not narrow in origin, focus, support, or goals. The diversity of task forces at work on education around the country—task forces including citizens, parents, students, teachers, administrators, business and community leaders, and elected and appointed public officials—is evidence of the scope.

The extraordinary array of initiatives under discussion and underway is impressive: performance-based pay, incentives for outstanding achievement, career ladders, new teacher preparation programs, revised graduation requirements, increased college admissions requirements, longer school days, and new extracurricular and athletic policies.

The comprehensive nature of this movement helps explain new coalitions of State and local officials, colleges and universities, the private sector, and schools working on quality education. Such coalitions can be seen in North Dakota, which has developed a proposal to recognize and reward "merit schools," and in the effort to improve textbooks, in which a conference organized by the State of Florida has focused the nationwide attention of legislators, scholars, educators, and publishers on the goal of improving the quality of school texts and instructional materials.

Finally, the scope of the reform effort includes both short- and long-term strategies for improvement. In some cases, action on comprehensive packages has been completed. But in others, decisions will be made as State and local studies are announced, options debated, and implementation plans completed. Yet another approach involves pilot testing of proposals and research on their effects before requiring wholesale adoption.

STATE EFFORTS

State leadership is one of the hallmarks of this reform effort. As of April, the Education Commission of the States counted 275 State-level task forces working on education in the past year.

Governors' State of the State messages delivered to 1984 legislatures were dominated by the theme of excellence in education. Textbooks, career ladders, performance-based pay, and graduation requirements are all under review, and most States have been fortunate to have the active support of leading legislators, prominent private citizens, and businessmen and women.

The national reports are not the only lever for change. Many States have been working on these issues for some time. The confluence of these State and national activities explains in large part the success of the reform movement. Moreover, astute political leaders have seized the nationwide interest to enact education agendas that had been languishing at the State level.

The next section of this report provides a detailed listing of educational reform in each State and the District of Columbia. These individual efforts add up to significant national change. For example, of the 51 jurisdictions:

- Forty-eight are considering new high school graduation requirements, 35 have approved changes.
- Twenty-one report initiatives to improve textbooks and instructional materials.
- Eight have approved lengthening the school day, seven, lengthening the school year, and 18 have mandates affecting the amount of time for instruction.
- Twenty-four are examining master teacher or career ladder programs, and six have begun statewide or pilot programs.
- Thirteen are considering changes in academic requirements for extracurricular and athletic programs, and five have already adopted more rigorous standards.

LOCAL EFFORTS

As school began last fall, *Newsweek* noted it "was going to be different this year." In public and private schools across the country this is proving to be the case as changes are proposed and implemented. School will probably be "different" for some years to come.

No systematic survey exists of the prevalence or nature of local efforts, but the number and quality of changes being publicized suggest a powerful and broad-based movement. Many local boards created their own local commissions and task forces in response to the national attention and rated their own schools against checklists of the findings and recommendations of the national reports. The National School Boards Association distributed about 100,000 checklists to local boards.

Other boards capitalized on the heightened public interest to enact changes that had long lain dormant. Still other localities report that school bond and school board proposals have received more support since the intense publicity directed a spotlight on the schools. In at least two cases, *A Nation at Risk* was used in a local political context: one candidate for local school board simply used the text as his platform; in another district, the text was included with the property tax bill mailed to local residents.

OTHER EFFORTS

The past year also saw a quantum increase in the variety of public school activities involving leaders of the university, corporate, and foundation communities. The scope of these activities does not permit easy categorization or description, but some general observations can be made.

Postsecondary Education: Colleges and universities, although not the focus of most of the reform interest, have become involved in partnerships with the schools. The array of activities represents the variety of local problems and the diverse nature of higher education. The responses include placing scholars in schools, raising entrance requirements, collaborative efforts to improve the relationship between high school and undergraduate programs, institutional study groups on excellence, and teacher education reforms. The diverse activities in the world of postsecondary education include:

- Teacher education reforms emphasizing more academic content as well as more experience in classrooms, including internship programs.

- Statewide and local study groups working with individual schools and districts to define the skills and competencies required to improve the chances of making a successful transition to undergraduate education.

- Undergraduate scholarships, frequently offered in conjunction with local employers, to encourage study in such fundamental areas as writing, mathematics, and science.

- Thirteen collaborative experiments supported by the College Entrance Examination Board to smooth the student's passage from high school to college.

- A joint statement from the Presidents of Harvard, Stanford, Michigan, Wisconsin, Chicago, and Columbia defining ways in which major research universities could strengthen their ties with schools.

Corporate and Business Activities: Reliable figures on corporate gifts to elementary and secondary education are not available. The Council on Financial Aid to Education estimates that corporations provided a record $1.3 billion in gifts and equipment to education in 1982, but only about 4 percent went to public and private elementary and secondary schools.

Nevertheless, several multi-year corporate awards are of national consequence. These include: a $3 million commitment in the publishing world to improve literacy; a major oil corporation's $6.7 million award for films and materials to improve mathematics teaching; and significant donations of computer equipment from major firms, including one gift of $12 million in computers to 26 cities.

The scope and magnitude of business support for the schools has increased dramatically in the past few years, particularly in two areas: support for local education foundations, and innovative efforts including national advertising campaigns and partnership programs which involve employees, officers, and even stockholders in local school improvement.

Corporate outreach efforts are impressive:

- Eleven major corporations have agreed to help the public schools of the District of Columbia establish a management institute to help principals and administrators improve their school management skills.
- The California Business Roundtable commissioned a costly independent study of how to improve California public schools and vigorously supported State reform legislation.
- A remarkable variety of adopt-a-school programs exists across the country, including not only businesses, but also civic groups and trade unions. Tutoring, counseling, field trips, guest speakers, and summer jobs for students and faculty are among the benefits provided by these programs. In Los Angeles alone, over 200 employers have adopted schools.
- More than 400,000 business representatives, mostly from small businesses, serve on almost 40,000 vocational education advisory councils, and thousands of working farmers are involved with nearly 8,000 Future Farmers of America clubs.

Foundations: A number of large independent foundations have always taken a significant interest in American public education. That interest has never been more apparent than in the past several years. Major foundations provided substantial support for the development of several of the reports produced in the past year.

Philanthropic commitment to improving education has intensified in the aftermath of the studies. Significant awards include those from the Carnegie Corporation to the Education Commisson of the States for a program to help government and business leaders improve education, from the Atlantic Richfield Foundation for a Carnegie Grants Program for High

School Improvement, and from the Ford Foundation for awards to address the educational problems of migrants and refugees and to help teachers in urban schools.

According to the *New York Times* last November, an estimated 350 local education foundations have been established in the past few years. Formed by local boards, businessmen and women, and other community leaders, these foundations provide funds for specific educational activities and rally community support for the schools.

1984 AND BEYOND

As the Nation moves forward with the agenda defined last year, it becomes apparent that defining the goal of excellence and mapping the route represent but a beginning. The call for excellence in education as a foundation for excellence in the Nation has been issued and heard. But difficult, seemingly intractable problems of implementation and practicality remain to be understood and attacked.

It has always been clear that changes in one area of education, such as graduation requirements, immediately affect virtually all others, including the time available for instruction, the role and qualifications of teachers, fundamental questions about the purpose of American secondary schools, and local leadership and fiscal support.

What is most encouraging about current developments is that citizens, educators, and leaders of business and government are acting on the understanding that education is a seamless garment, and are proposing and supporting comprehensive solutions.

Of all the issues emerging, educators believe that the greatest perseverance will be required to reconcile the traditional emphasis on access with the developing imperative for excellence. They fear that ignoring either goal places enduring national values in jeopardy.

The National Commission on Excellence in Education recognized that special support and attention should be provided to particular groups at risk, including the gifted and the educationally disadvantaged. The Commission was convinced that the solution to the apparent dilemma of pursuing both equity and excellence lay in a system of institutions and values that encouraged everyone to perform at the boundaries of individual ability in ways that tested and extended personal limits.

This reconciliation requires the wit, skill, and ingenuity of every student, parent, citizen, and public official. As the Commission reminded us, it is the America of all of us that is at risk, and it is to each of us that the imperative for excellence is addressed.

THE NATION RESPONDS

Recent Efforts to Improve Education

United States
Department of
Education

MAY 1984

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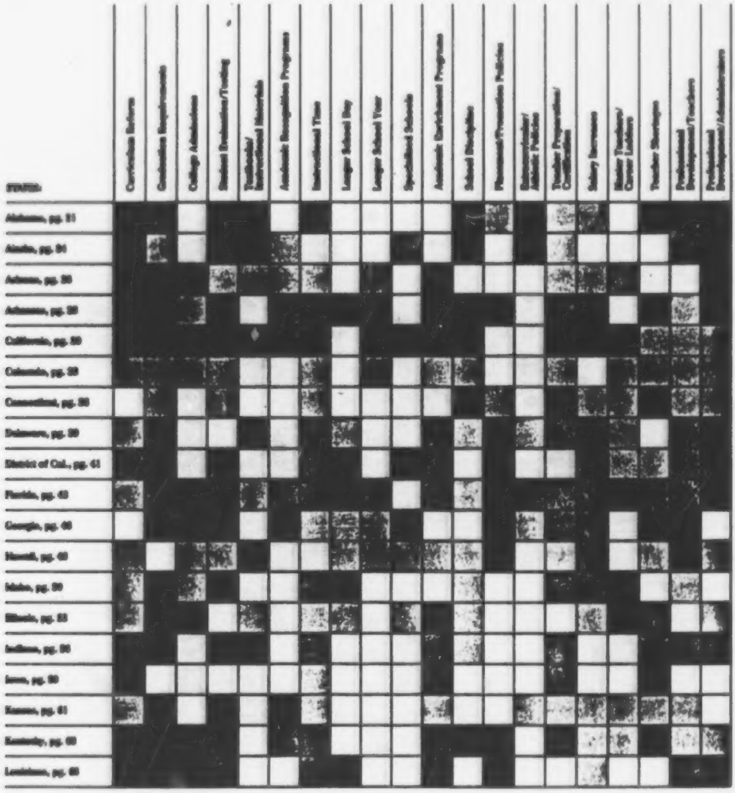
RECENT INITIATIVES REPORTED BY STATES AND THE DISTRICT OF COLUMBIA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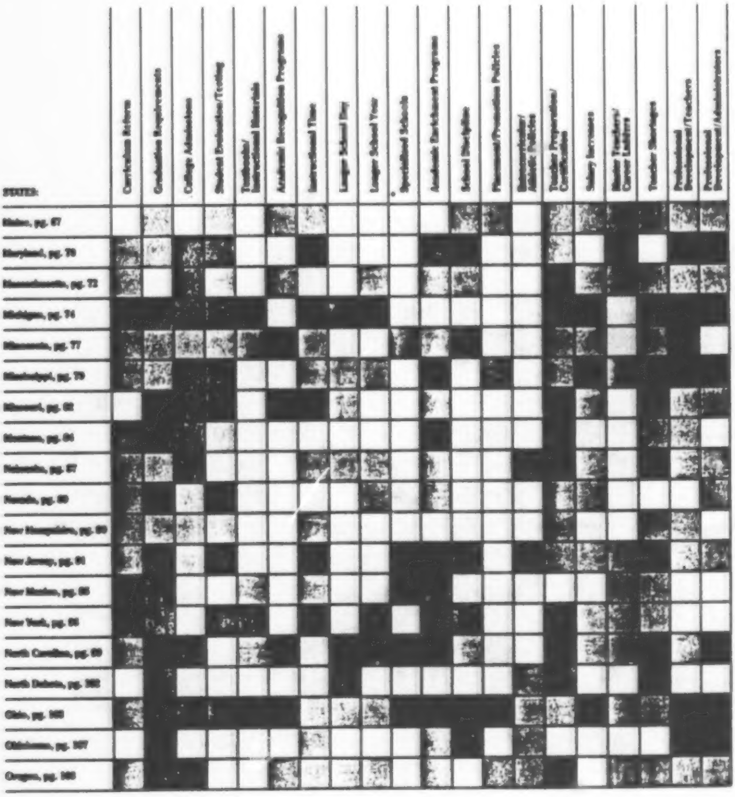
▨ Under Consideration or Proposed

■ Enacted or Approved

RECENT INITIATIVES REPORTED BY STATES AND THE DISTRICT OF COLUMBIA



STATES:	Curriculum Reform	Graduation Requirements	College Admissions	Student Evaluation/Testing	Textbooks/ Instructional Materials	Academic Recognition Programs	Instructional Time	Longer School Day	Longer School Year	Specialized Schools	Academic Enrichment Programs	School Discipline	Placement/Promotion Policies	Homework/ Attendance Policies	Teacher Preparation/ Certification	Salary Increases	Master Teachers/ Career Ladders	Teacher Shortages	Professional Development/Teachers	Professional Development/Administrators
Maine, pg. 67		▨		▨		▨	▨					▨	▨		▨	▨	■	■	▨	▨
Maryland, pg. 70	▨	▨	▨	▨			■				■	■			▨		■		■	■
Massachusetts, pg. 72	▨		■			▨			▨		▨	▨			■	▨	■	▨	▨	▨
Michigan, pg. 74	■	■	■	■	■		■	■	■						■	■		■	■	■
Minnesota, pg. 77	▨	▨	▨	▨	▨	■	▨			▨	▨	■			▨	▨		▨	■	
Mississippi, pg. 79	▨	▨	■	■			▨	▨	▨		■		■		▨	■	■	■	■	■
Missouri, pg. 82		■	■	■		■	■	▨			▨				■	▨		■	▨	▨
Montana, pg. 84	■	■	■	▨							■				■			▨	▨	
Nebraska, pg. 87	▨	▨	■				▨	▨	▨		▨			■	■	▨		■	▨	▨
Nevada, pg. 89	▨	■	▨	■					▨		▨				▨	▨				▨
New Hampshire, pg. 90	▨	▨	▨	▨			▨								▨			▨	▨	
New Jersey, pg. 91	▨	■	▨	■			■			■	■	■		■	▨	▨	■	■	▨	▨
New Mexico, pg. 95	■	■			▨		▨			■	■						■	▨		
New York, pg. 96	■	▨		■	■		■		■		■	■			■	▨	▨	▨		
North Carolina, pg. 99	▨	■	■		▨	■		■	■	■	■	▨			■	▨	■	■	▨	■
North Dakota, pg. 102		■						■						▨	■			■		
Ohio, pg. 103	▨	■	■	■	■	■	▨	▨	▨	■	■	■	■	▨	▨	■	▨	▨	■	■
Oklahoma, pg. 107		■					▨				▨	■		▨					■	■
Oregon, pg. 108	▨	■	■			▨	▨	▨	▨		▨		▨	▨	■		▨	▨	▨	▨

▨ Under Consideration or Proposed

■ Enacted or Approved

RECENT INITIATIVES REPORTED BY STATES AND THE DISTRICT OF COLUMBIA

STATES:	Curriculum Reform	Graduation Requirements	College Admissions	Student Evaluation/Testing	Textbooks/Instructional Materials	Academic Recognition Programs	Instructional Time	Longer School Day	Longer School Year	Specialized Schools	Academic Enrichment Programs	School Discipline	Placement/Promotion Policies	Extracurricular/Athletic Policies	Teacher Preparation/Certification	Salary Increases	Master Teachers/Career Ladders	Teacher Shortage	Professional Development/Teachers	Professional Development/Administrators
Pennsylvania, pg. 110	■	■	■	□	■	■	■	□ •	□	■	□	■	■	■	■	□	■	■	□	■
Rhode Island, pg. 113	□	□	■	■	□	■	□	□	□	□	□	□	□	□	■	□	□	□	□	□
South Carolina, pg. 115	□	■	□	■	□	■	■	■	■	■	■	■	■	■	□	■	□	■	□	■
South Dakota, pg. 118	□	■	■	■	□	■	□	□	□	□	■	□	□	□	■	□	□	□	□	□
Tennessee, pg. 120	■	■	□	■	■	■	■	□	■	■	■	■	■	□	■	■	■	■	■	■
Texas, pg. 123	■	■	□	■	■	□	■	□	■	□	■	■	■	■	■	■	■	■	■	■
Utah, pg. 125	□	■	□	□	□	□	□	■	□	□	□	□	□	□	■	□	■	□	□	□
Vermont, pg. 127	■	■	□	■	□	■	□	■	■	□	■	□	□	□	■	□	■	■	■	■
Virginia, pg. 130	■	■	□	■	■	■	■	□	□	■	■	□	□	■	■	■	■	■	■	■
Washington, pg. 133	■	■	■	■	■	■	□	□	□	■	■	□	■	□	□	■	■	■	□	■
West Virginia, pg. 135	■	□	■	■	□	□	■	□	□	□	■	□	□	■	■	■	■	□	■	■
Wisconsin, pg. 138	■	■	■	■	■	■	■	■	■	□	■	□	□	□	■	■	■	■	■	■
Wyoming, pg. 141	□	□	■	□	□	□	□	□	□	□	■	□	□	■	■	□	□	■	□	■
TOTAL ■	23	13	12	13	10	6	20	13	14	5	11	13	8	13	19	20	24	16	21	16
TOTAL ■	22	26	22	29	11	18	18	8	7	11	29	13	11	5	28	14	6	23	20	22
TOTAL	45	40	34	42	21	24	38	21	21	16	40	26	19	18	47	34	30	39	41	38

□ Under Consideration or Proposed

■ Enacted or Approved

MAJOR ISSUES SYSTEM

ISSUE BRIEF IB83106

EDUCATION IN AMERICA: REPORTS ON ITS CONDITION, RECOMMENDATIONS FOR CHANGE

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ISSUE DEFINITION

The quality of education in our schools, particularly our high schools, and appropriate Federal actions to improve educational quality have become a major political issue. A number of reports on education with recommendations for change have been issued, among them A Nation At Risk by the National Commission on Excellence in Education. These reports are critical of how our schools are functioning and call for improvement in areas such as teaching, curriculum, and standards for student performance and behavior. Some issues raised by these reports are whether these changes are needed, how these changes might be implemented, and what might be the roles of different levels of government in this process.

BACKGROUND AND POLICY ANALYSIS

Introduction

For more than two years, reports critical of the condition of American education, particularly at the high school level, have been issued periodically by a diverse mix of national commissions, task forces, and academic groups. These reports come at a time of concern about American economic productivity, international competition, and the impact of new technology on the workforce. Debate is currently underway over the performance, goals and needed changes in American education, and, particularly, over what the Federal role should be.

This issue brief considers the role of reform reports focused on the high school, provides brief summaries of ten of the reports and explores the possible answers to a series of questions that arise from the reports. These questions are:

(1) What is the condition of schooling in this country?
(2) What are the causes of educational problems in our schools?
(3) Are the recommended changes appropriate?
(4) What has been happening in the States in response to the recent reports?
(5) What are the possible Federal responses to the problems highlighted by the recent reports?

It should be noted that many of the most recent reports on American educational performance are focused on higher education. These reports are not considered in this issue brief (e.g., "Involvement In Learning: Realizing the Potential of American Higher Education", report of the Study Group on the Conditions of Excellence in American Higher Education, sponsored by the National Institute of Education; or "To Reclaim a Legacy: A Report on the Humanities in Higher Education", by William J. Bennett, National Endowment for the Humanities).

Role of Reform Reports

Reporting on how well or how poorly our secondary schools are functioning is not a new activity. High schools have been the subject of such reports since their emergence as widely accepted institutions in the late 19th century. What is evident from a review of previous high school "reform" reports is that such reports embraced widely different images of the high school. In some instances, the high school was viewed principally as a means of preparing academically talented youth for college. Other reports saw the high school as preparing American youth for the wide variety of social and career paths they would follow. Still others have viewed the high school as an engine for social change or as a means of harmonizing a diverse population within a democratic society.

In the view of some observers, school "reform" reports reflect the educational and political climates in which they are written. In "conservative" periods, they claim, the reports stress international competition, the development of basic skills and the strengthening of the academic curriculum. In more "liberal" times, according to the thesis, educational change is focused on "disadvantaged" students and the broader functions of schooling for the society. This perspective may be used to challenge the validity of these "reform" reports and argue against their calls for change.

In contrast, others might contend that it is an oversimplification to categorize historical periods as "conservative" or "liberal" and to characterize all of the school "reform" reports produced in any time period with a single label. Some have asserted that the reports often do gauge how well schools are functioning, and provide necessary balance to previous educational changes.

Summaries of Recent Reports

The ten reports summarized below, which are among the most significant released to date, are from:

(1) the National Commission on Excellence in Education (A Nation At Risk),
(2) the Twentieth Century Fund Task Force (Making the Grade),
(3) the National Task Force on Education for Economic Growth (Action for Excellence),
(4) the Carnegie Foundation for the Advancement of Teaching (High School),
(5) A Study of High Schools (Horace's Compromise),
(6) A Study of Schooling (A Place Called School),
(7) the National Science Board Commission on Precollege Education in Mathematics, Science, and Technology (Educating Americans for the 21st Century),
(8) the Paideia Group (The Paideia Proposal), and
(9) the Educational EQuality Project (Academic Preparation for College).
(10) The National Coalition of Advocates for Students (Barriers to Excellence).

The first four of these reports are those that probably have received the most attention from the public, the media, government, and the education community.

Most, but not all of these reports, focus almost exclusively on the conditions in the Nation's secondary schools. The educational performance of schools, according to these reports, is not good; indeed, for some of the reports (such as that from the National Commission on Excellence in Education), the criticisms apparently so outweigh any of the positive aspects of these institutions that schools earn close to a failing grade. Most of the reports decry lax academic and behavioral standards exhibited by the schools. Most address with particular emphasis the professional lives of teachers, concluding that changes in the way teachers are trained, their patterns of compensation, and their working conditions are essential.

Although there are general areas of agreement among the various reports (such as poor academic performance by students, serious teaching deficiencies, and a need for reform), it is the diversity of the suggested reforms that may be among the most startling features of the reports. As the summaries below suggest, this diversity stems in part from different perceptions of the goals and ends of schooling. Some of these reports, much more than others, are concerned with the process of education that occurs in the classroom (for example, the reports from the Carnegie Foundation, A Study of Schooling and A Study of High Schools). As a result, the suggested reforms from these reports (ranging from creating smaller schooling units within schools, to creating larger blocks of instructional time, to integrating the educational and work environments outside of the school into the school curriculum) are more structural than are those from some of the other reports (e.g., increasing high school graduation and college admissions requirements). Finally, some of the reports are more likely than others to consider that schools, particularly high schools, are directly influenced by social, demographic, and educational changes (among others), affecting who goes to school and how they interact with the existing educational system (the report from the National Coalition of Advocates for children, for example).

What follows are brief summaries of these ten reports, highlighting their assessment of the appropriate Federal role in the effort to improve academic performance.

National Commission on Excellence in Education

On Apr. 26, 1983, the National Commission on Excellence in Education, chartered by Secretary of Education Bell in 1981 with the task of examining the quality of American education, issued A Nation At Risk: The Imperative for Educational Reform. The Commission concludes that "the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people." The Commission posits that quality education for all members of the society is essential for maintaining the country's competitive edge in international economic markets, and for success in the so-called "information age."

Focusing on secondary education, the Commission asserts that the high school curriculum is too diffuse and lacks a central purpose; that high school students are excessively found in general track programs and not academic track programs; that students spend time ineffectively and inefficiently, particularly in comparison with their counterparts in other countries; and that teaching is attracting too few academically able persons and offers a professional life that is "on the whole unacceptable."

The Commission recommends that a high school diploma be granted only to students who take, at a minimum, 4 years of English, 3 years of math, 3 years of science, 3 years of social studies, and a half year of computer science. Two years of foreign language is recommended for those students intending to go to college. The Commission calls for more effective use of time as well as an increase in the amount of in-school time. The Commission also recommends more homework, a rigorously enforced conduct code, and an end to student promotion based on age. A 7-part recommendation is made concerning teaching, calling for higher salaries sensitive to the market and teacher performance, and career ladders for teachers.

The Commission concludes that States and localities are primarily responsible for financing and governing schools. The Federal role, according to the Commission, is to identify and support the national interest in education, and, also, to address the needs of special groups of children -- gifted, socioeconomically disadvantaged, minority, limited English speaking, and handicapped children.

Twentieth-Century Fund Task Force

The Twentieth Century Fund Task Force on Federal Elementary and Secondary Education Policy issued its report, Making The Grade, shortly after that of the National Commission. The Twentieth Century Fund is an independent research foundation.

The Task Force asserts that the "Nations public schools are in trouble." They are failing to educate and motivate students and are characterized by low test scores, high drop out rates, violence, and inadequate teaching. Schools, according to the Task Force, must impart a common core of knowledge to all students, consisting of reading, writing, calculating, "technical capacity in computers," science, foreign languages, and civics.

The Task Force recommends a federally funded Master Teacher program to provide the country's best teachers with 5-year financial awards ($40,000 a year is suggested). The Federal Government, it is recommended, should establish English language literacy as the principal goal for elementary and secondary education; and Federal bilingual education funds should be used only to teach English to non-English speaking children. The Task Force posits that every public school child should have an opportunitity to learn a second language. The Task Force recommends certain incentives to increase the number of math, science, and foreign language teachers. Federal categorical grant programs for economically disadvantaged children and the handicapped should be continued, and the "impact aid" program should be used to aid school districts with substantial numbers of immigrant children. Federal research efforts, according to the Task Force, should be continued and directed at collecting data on educational performance and the evaluation of Federal program.

The Task Force states that "educating the young is a compelling national interest, and that action by the Federal Government can be as appropriate as action by State and local governments." The Federal role is to continue assisting the disadvantaged as well as to take a primary position in meeting the need for educational quality.

National Task Force on Education for Economic Growth

On June 22, 1983, the National Task Force on Education for Economic Growth, established by the Education Commission of the States in December 1982, released a report entitled Action for Excellence: A Comprehensive Plan to Improve Our Nation's Schools.

The Task Force highlights what it labels deficiencies in public elementary and secondary schools. Despite gains in basic skills achievement recorded by black students and other disadvantaged children, the Task Force finds a decline in higher order skills, such as problem solving. Teaching positions in some areas, such as math, are filled by individuals uncertified to teach those subjects; and little time is spent weekly on science and math in the typical elementary school. Principals, identified as important leaders in the quest for educational quality, are unduly diverted from their appropriate tasks.

The Task Force asserts that improved education and training are essential for economic growth, the national defense, and social stability.

Focusing primarily on the roles that States and business might play in addressing educational deficiencies, the Task Force calls upon each Governor to adopt an "action" plan for improving public education. Business and school partnerships are advocated. It is recommended that States and local school boards improve the ways teachers are recruited, trained, and compensated; and that salary schedules should be made competitive, with financial incentives provided for good performance. The Task Force calls for more effective use of time in school and that consideration be given to lengthening that time. In addition, requirements for discipline, attendance, homework, and grading should be strengthened. Finally, the Task Force recommends special education efforts for different groups of students, including women and minority students, gifted students, dropouts, and the handicapped.

The Task Force believes that the Federal role in education is significant, reflecting that education is a national priority. The Federal responsibilities include assistance to the disadvantaged, financial aid for postsecondary students, research and development support, and efforts to meet the country's labor needs.

Carnegie Foundation for the Advancement of Teaching

On Sept. 15, 1983, the Carnegie Foundation for the Advancement of Teaching issued a study entitled High School: A Report on Secondary Education in America, based on over 2 years of observations at 15 high schools. The report was principally authored by Ernest L. Boyer, president of the Foundation.

The Carnegie report concludes that high schools "lack a clear and vital mission." Many students fail to master the English language; teachers work under conditions precluding effective or sustained teaching; principals are poorly prepared to lead.

The report says that high schools should teach students how to think critically and communicate effectively; should teach students about themselves, their heritage, and other cultures and nations; should prepare students for work and further education; and should help students meet their social and civic obligations.

The report provides "an agenda for action" that begins with each high school clarifying its goals. Mastery of the English language is the next priority after goal-setting, with each high school student completing a year-long basic English course and a semester-long speech course. These courses would be part of a single track core curriculum in which all students would take 1 year of literature, a semester of arts, 2 years of foreign languages, 2-1/2 years of history, 1 year of civics, 2 years of science, 2 years of math, semester-long courses in technology and health, a seminar on work and a senior independent project. All students would complete a new service unit of volunteer work in their schools or communities.

For teachers, the report calls for reduction in teaching loads, a 25% increase in current compensation over the next 3 years, rewards for teaching excellence, and a new career path with three stages. Full tuition scholarships should be offered by colleges to the top 5% of their juniors who plan to teach in public schools; and the Federal Government should establish a National Teacher Service offering scholarships to those graduating in the top one-third of their high school class.

The report calls for flexibility in structuring high schools, including larger blocks of instructional time and smaller within-school units. The report cautions against unplanned purchases of computer hardware.

With regard to governmental roles in education, the report admonishes States "to establish general standards and provide fiscal support, but not to meddle." The Federal Government is to be a partner in renewing educational excellence. Three broad purposes for Federal action in education are identified -- providing information on the condition of education, assisting disadvantaged and handicapped students, and working to meet emergency national needs.

A Study of High Schools

Horace's Compromise: The Dilemma of the America High School, by Theodore R. Sizer, is the first report from A Study of High Schols, a 5-year study sponsored by the National Association of Secondary School Principals and the Commission on Educational Issues of the National Association of Independent Schools.

This first report posits that high schools are not serving the country well for many reasons. High schools fail to use appropriately adolescents' desires for a high school diploma and respect; they have an outdated and unduly comprehensive set of educational and social gooals; they attempt to convey information, rather than instill the skills needed to use information; they fail to grant teachers the independence they need to teach effectively; and they pay teachers too little and fail to reward excellence. Educational policymakers, according to the report, confuse standardization with standards, thereby making the educational system unduly structured and inflexible.

The report advocates that, once students have mastered literacy, numeracy, and an understanding of civic responsibilities (the task of junior high school and lower levels), they should not be compelled to attend school.

High school attendance, as result, would be voluntary. High schools, according to the report, should have three objectives: development of intellectual skills (taught by "coaching"), acquisition of knowledge (taught by "telling"), and understanding of ideas and values (taught by "questioning"). The report suggests that high schools focus on four subject areas: inquiry and expression, mathematics and science, literature and arts, and philosophy and history.

Improvement of teachers' working conditions is the solution to improving high school education, according to the report. It recommends, among other things, that teachers be given more autonomy; be held accountable for their students' performance; be responsible for fewer students; have steeper salary schedules; and have a safe place to work.

The report calls for teachers and principals to be given greater authority. Smaller units are necessary, according to the report, so that teachers can come to know their students and develop the teaching strategies necessary for each.

The Paideia Group

The Paideia Proposal: An Educational Manifesto, written by Mortimer J. Adler on behalf of the Paideia Group, was published in 1982. The Proposal calls for an extensive reform in the structure, content, and methods of schooling. All students would be in a single track with no electives save for the choice of foreign language. Schools would have three goals: to provide students with a base of organized knowledge in areas such as language, mathematics, and science (the teaching method would be lecturing); to develop students' intellectual skills in the use of tools such as reading, writing, speaking, and problem-solving (the teaching methods would include coaching, exercises, and supervised practice); and to enlarge students' understanding of ideas and values (the teaching methods would be "Socratic" questioning and active participation in discussions of books and performances of artistic works).

The College Entrance Examination Board

The College Board has undertaken a 10-year project called the Educational EQuality Project to improve secondary education and ensure equal opportunity for postsecondary education. One product of this effort, "Academic Preparation for College: What Students Need to Know and Be Able to Do," released in 1983, identifies six "basic academic competencies" -- reading, writing, speaking and listening, mathematics, reasoning, and studying. An "emerging" competency is knowledge about computers. The "basic academic subjects" are English, the arts, mathematics, science, social studies, and foreign languages. For each subject and competency, the report defines what a student needs to know in preparation for college entrance.

National Science Board Commission on Precollege Education in Mathematics, Science, and Technology

On Sept. 13, 1983, the Commission issued its report to the Board entitled "Educating Americans for the 21st Century." The Commission concludes that the U.S. "is failing to provide its own children with the intellectual tools needed for the 21st century." To build a "national commitment" to educational excellence, the Commission recommends that the President form a National Educational Council. Recommended efforts in a 5-year program to upgrade teaching include higher standards for new teachers and Federal support for State teacher training programs. It is also recommended that highly qualified math, science, and technology teachers receive competitive salaries. The report calls for more time in school on math and science, beginning at the kindergarten level. It is recommended that all high school graduates should take 3 years each of math and science, and that colleges should raise admissions standards to require 4 years each of math and science. To increase instruction time on these subjects, the Commission recommends increasing the school day, week, or year. The National Science Foundation is called upon to take a lead role in assessing educational technology. The Commission recommends that the President establish a Council on Educational Financing to determine the costs of its recommendations and what levels of government should provide funding. The Commission estimates that its recommendations for Federal action will cost $1.51 billion in the first year of implementation of this 12-year plan.

A Study of Schooling

The multi-year project called A Study of Schooling was directed by John I. Goodlad. That project has resulted in many products, the most recent being a book entitled A Place Called School: Prospects for the Future. Among the book's findings are the following: although very high and very broad goals are often set for schools, what goes on in classrooms is often at odds with those goals; schools on average give priority to reading, writing, and basic math skills; vocational education occupies a large space in the junior high curriculum and a larger space in the senior high curriculum; uneven attention is given to sciences and social studies in the curriculum and relatively little is given to foreign languages and arts; and resources (teachers and time) are inconsistently given to specific subject areas across schools. The research apparently shows that schools concentrate on basic skills, failing to develop higher intellectual skills and interests. It was found that teachers rely almost exclusively on lecturing; students remain largely passive in the schooling process. Reports from the project have suggested that certain changes are needed, such as: improvements in the instructional modes now in use; better selection procedures for, and better preparation of, principals; improved teacher education programs; a single track curriculum; and some restructuring of schools to create small within-school units with a group of teachers responsible for not more than 100 students for 4-year periods.

National Coalition of Advocates for Students

In January 1985, the National Coalition of Advocates for Students issued a report entitled "Barriers to Excellence: Our Children at Risk." In this report, the Coalition, whose member organizations are child advocacy groups, concluded that "The creation of learning communities requires basic changes in the curriculum, teaching practices, organization, and structure of our schools. Yet, current proposals for reform assume that it is doses of old-fashioned medicines involving only minor changes in the policies and structure of schools which will realize the goal of educational excellence."

The primary concern for the Coalition is the child "at risk" and his or her diversity with regard to class, race, ethnicity, culture, sex, and handicapping condition. The Coalition found that much of elementary and secondary schooling for "at risk" children is characterized by: subtle discrimination; barriers to improvement (such as inflexible scheduling and curriculum, tracking, rigid ability grouping, standardized testing misuses, curriculum and teaching that are insensitive to the diversity of students,and a lack of support services for children and youth); and declining economic support for schools, students, and their families reflected in or accompanied by inequitable and insufficient financing for schools, and an absence of middle income jobs.

The report calls for, among other things: greater responsibility accorded to local school officials and staff for educational outcomes; greater involvement of parents in the educational process; an end to tracking and fixed grouping; inservice training for teachers to enable them to address the needs of their students; and high expectations for the performance of all participants in the educational process (from parents to administrators). Among the Federal actions advocated by the Coalition are: support for and expansion of Chapter 1 (Education Consolidation and Improvement Act) services; protection of students' civil rights; provision of adequate funds for Title IV of the Civil Rights Act (desegregation training and advisory services to education); expansion of requirements for parental involvement in Federal education programs; and support for comprehensive school-to-work transition programs serving all school districts.

Selected Questions Prompted by the Reports

The following selected questions arise from a consideration of the various "reform" reports. Examples are offered of the issues involved in answering these questions..

1. What is the condition of schooling in this country?

The various reports emerging now find our schools to be inadequately preparing students for their futures. The indicators of that poor performance include declining test scores; the extent to which institutions that receive our high school graduates (colleges and businesses) have to implement remedial education and training programs; the high degree of functional illiteracy in the population; and the Nation's poor showing in international comparisons of student achievement.

This is not an uncontested reading of how well our schools are functioning. Some would contend that our schools are succeeding in meeting certain challenges posed by the preceding several decades. A far larger portion of our youth, they assert, receive a full 12 years of schooling than did in the not so distant past in this country, and than do at present in some industrialized countries. Access to high school has been expanded to many minority groups and to the economically disadvantaged. Indeed, some of these observers would argue, the problems identified today are the result of that very success in expanding access to secondary education. Still others acknowledge the inadequacies of our schools but believe minority and economically disadvantaged students, among others, to be the primary victims of these shortcomings.

The question of gauging how well a school system is functioning may pose serious technical problems. The indicators cited above are not unambiguous in the information they provide. To some, the statistics purporting to measure performance in schools are often suspect. They would posit that the decline in Scholastic Aptitude Test (SAT) scores, frequently cited as an indication of educational failure, reflects the expansion of high school and college education to embrace many of the socioeconomically disadvantaged children in our country. It is not the same group of children, they would argue, taking the test today as a decade and a half ago. In addition, it is argued that the SAT scores and others reflect other societal changes outside of the schools. Significantly, the SAT scores have stabilized and even risen in recent years. As an indicator of progress rather than decline, some cite improvement in the performance of socioeconomically disadvantaged children in the elementary schools over the past decade as measured by the National Assessment of Educational Progress. Further, it is posited that using test scores to compare national education systems often results in inappropriately comparing dissimilar systems, particularly given the greater retention of school-aged youth in schools in the United States. Average scores of student samples reportedly reflect how open a system is, not how well it educates its academic elite.

In contrast, others argue that the sheer weight of the number of negative indicators clearly indicts the performance of our schools. With regard to specific measures, they assert, ambiguity may be in the eye of the beholder, reflecting a predetermined position. Although a portion of the decline in SAT scores over the past decade and a half can be attributed to changes in the characteristics of the group taking the tests, SAT results reportedly show an absolute decline in the number of high performers on the tests. Further, it is argued that the improvements in the National Assessment of Educational Progress scores are largely limited to the lowest grades, age groups, and achievement quartiles; decline continues to be the watchword for secondary school students. Indeed, critics point to a decline in the higher order cognitive skills, even as some basic skills improve. Finally, they counter the position described above with regard to international comparisons by pointing to the mediocre position attained by the United States even when scores are adjusted to reflect retention in school systems.

2. What are the causes of educational problems in our schools?

Most of the recent reports largely restrict their consideration of educational problems to the outcomes of our schools -- low test scores, remedial courses increasingly offered in colleges, inadequately prepared labor force entrants, etc. In turn, they largely restrict their consideration of causes to what reportedly goes on within the school -- teachers do not teach and have no incentive to do so, standards are lax, the curriculum is diluted with non-academic electives, homework is not assigned frequently enough, etc.

To critics, such reports subordinate the role that forces in the general society play in influencing the way schools function. Educational changes, according to this perspective, must consider the significant changes that have occurred in the American family, the educational impact of television (both actual and potential), and the changes in the nature and availability of work.

Recommended educational changes that ignore these various forces, some argue, would be inadequate to their task or, indeed, counterproductive. For example, what impact might a rigorous, mandated core curriculum have on school retention rates in light of the heterogeneous school population affected by these various changes? For example, the National Commission on Secondary Schooling for Hispanics in its report "Make Something Happen" draws attention to the "devastating effect" of high Hispanic dropout rates.

In response, it might be argued that focusing on the schools recognizes the central role they play in molding the society in general. To direct recommendations for change beyond the schools might lessen the chances of implementation for any particular package of recommendations; and also might divert attention from the real problems within the schools that are susceptible to change. It might be asserted that the schools are one of the social institutions in which change might be fruitfully sought. Indeed, the various reports do recognize the influence of society on the schools, particularly as other institutions reportedly abdicate their traditional responsibilities and thrust them upon the schools. It might be argued that educational change within the schools is a healthy step toward restoring the sense of responsibility in those other societal institutions and restricting the schools to the roles they were intended to, and are able to, play.

3. Are the recommended changes appropriate?

There are two facets to this question -- the effectiveness of specific proposals and the kinds of compromises their implementation might require.

Debate over some of the specific recommended changes in these reports is already underway, at the same time that many States and localities have implemented or are considering implementation of similar recommendations. The debate focuses on whether the proposed changes would accomplish their objectives. Consider, for example, the proposal of merit pay for teachers, offered as one solution to the teaching problems identified by these reports. On the one hand, information on merit pay as it has been used in various fields suggests to critics that it does not necessarily function as intended. The process reportedly can be subject to biases and favoritism. Objective determination of which teacher competencies should be assessed and development of objective ways to assess them would pose, according to this argument, serious technical and cost barriers to successful implementation. It has been argued that unless the increase in pay for meritorious teaching is substantial, the incentive involved will be minimal. On the other hand, advocates of merit pay contend that it need not fall victim to past implementation problems. As responses to past problems, some have suggested involving those who will be evaluated in the process of structuring the assessment system, and drawing evaluators from outside the school or district where teachers under evaluation are currently working.

The other facet to the question of the appropriateness of the "reform" proposals -- the compromises that might be required -- is best illustrated by the tensions that may exist in our schools between excellence and equity, or as it is sometimes phrased, between educational quality and equality of educational opportunity. Consider, for example, the important curriculum changes being recommended by the Educational EQuality Project of the College Entrance Examination Board, and by The Paideia Group. The first of these focuses on the preparation of secondary school students for college, specifying the basic academic competencies that should be attained in high school and the courses that would provide these competencies. The second advocated in The Paideia Proposal by Mortimer J. Adler identifies the acquisition of basic factual knowledge, the development of intellectual skills, and the improvement of understanding about ideas and values as the appropriate objectives of our schools. The Paideia curriculum would be academically oriented; it would not contain a vocational component.

The adaptation of these curricular changes, it has been argued, might require a redirection of a substantial portion of the school curriculum, primarily away from general and vocational education programs. Critics argue that the academic role of schooling would be enhanced at the expense of other important roles -- job training among them. Given the heterogeneity of our school population, it is asserted, such a redirection in curriculum denies educational equity to many students; ignores the fact that all students do not learn the same subjects in the same way. They ask, Can all of the many needs of our diverse student population be served through a rigorous and required academic curriculum?

In response, advocates of these changes argue that the denial of educational equity occurs when educators assume that excellence and rigorous academic education are not appropriate for all youth. Indeed, they posit, the mastering of intellectual skills is more valuable for future work than training aimed at a specific kind of job. Others contend that past educational efforts have been focused on the non-academic responsibilities of our schools and that it is now time to address the academic needs of our students in a more coherent fashion. The setting of high standards and expectations, they contend, is likely to improve the quality of all schooling activities, to the benefit of all students.

4. What has been happening in the States in response to recent reports?

At the outset, it should be observed that the National Commission's report of April 1983 and the other reports discussed above did not initiate a school reform movement. They may have broadened awareness of the educational problems that many States and localities had already recognized in the mid to late 1970s. They may also have helped change the focus of some of those ongoing efforts. Topics such as merit pay for teachers, career ladders for teachers and the curricular requirements for high school graduation appear to be joining some of the earlier reform focuses, such as basic skills testing requirements for high school graduation and grade promotion.

The extent of State and local activity predating the 1983 reports is clear in view of survey data from the National Center for Educational Statistics (NCES) showing that, between 1979 and 1981, 69% of all local educational agencies took action to increase daily attendance and 53% increased the number of credits required in core subject areas. At the State level, other NCES data reveal that, between 1977 and 1982, approximately 20 States put in place competency-based teacher certification requirements; by 1982, 17 States had approved minimum competency testing requirements for high school graduation and 13 had approved statewide testing for remediation purposes.

The effects of the reports are reflected in surveys of State-level reform efforts. Among these surveys is that of the Department of Education (The Nation Responds) showing that 35 States recently changed their high school graduation requirements, 29 established academic enrichment programs, 29 changed their student evaluation/testing procedures, and 28 modified their teacher preparation/ certification procedures. In addition to the Department's survey, Education Week published results from a survey in its Dec. 7, 1983, and Feb. 6, 1985, issues; the National Conference of State Legislatures released a survey of action to improve education in selected States in November 1983; and the Education Commission of the States issued "Action in the States" in July 1984. Care should be taken with any of these surveys because at times they are cryptic in their descriptions, fail to note whether the particular action occurred prior to release of the reform reports, omit some initiative, or become quickly outdated.

Among the issues raised by State and local responses to the reports are the following:

-- will the interest and action continue?

-- how will these reforms be financed?

-- will the effects be uneven across the States?

-- how will special populations (such as the disadvantaged or handicapped) be affected?

-- how can the results of these actions be best measured?

-- how do the State efforts affect possible Federal responses?

5. What are the possible Federal responses to the problems highlighted by the recent reports?

As the preceding descriptions of the reports show, the primary areas of concern are teaching and the curriculum, areas which have traditionally been the province of States and localities. Indeed, States are acting to address these concerns. Any major Federal initiatives in these areas might entail marked shifts in the traditional roles played by the different levels of government in education. Nevertheless, Federal action in response to the problems being identified by the reports may be sought for a variety of reasons. Some observers assert that the inexpensive steps to improve education have already been taken, and that, despite concern about Federal budget deficits, Federal assistance to meet the high price tag of remaining improvements may be necessary. In addition, action at the national level may be sought because the 50 States, the District of Columbia, and 16,000 local school districts are very unlikely to achieve consistent results in their quest for educational quality. Finally, the resources at the Federal level may be needed for gathering and disseminating the data necessary to inform the on-going reform process, for developing certain instructional materials, and for continuing to direct widespread attention to the problems. Despite these reasons favoring Federal action, the activity by States and localities in the past several years may limit the extent to which Federal steps need to be taken.

In general, there are at least six broad categories of possible Federal responses to the reports -- funding and mandates, incentives, research and models, dialogue and consensus building, continuation of the current role, and reduction in the current role.

At one end of the spectrum of responses would be a new major Federal involvement, either in terms of the amount of funding devoted to the problems or the amount of Federal direction imposed on school systems, or both. A major involvement need not require new Federal spending. For example, new mandates could be added as a condition of the receipt of existing Federal education assistance, such as the education block grant. The implications of this kind of response for the Federal role in education are important, given the traditional limits on that role, and would reverse a trend toward increased State and local flexibility in the case of Federal aid, as exemplified by the 1981 Education Consolidation and Improvement Act.

A second kind of response might be on a modest scale, involving incentives for action, or limited conditions (such as needs assessment or planning) for the receipt of Federal funding that might, in turn, serve to encourage more significant changes. The determination of the problems and the selection of responses could remain at the State and local levels.

A third kind of response, decidedly more limited than those above, would focus on generating and disseminating information relevant to educational improvement. The Federal Government might support research on topics related to academic excellence, or fund some models showing how certain reform recommendations could be implemented.

Another kind of response might be limited still further to that of drawing attention to the problems in education and encouraging debate on possible solutions. One goal might be that of building a consensus about the appropriate strategies to be pursued at each level of government.

Federal education programs and responsibilities might remain directed, as they are generally at present, to particular groups of students with special needs -- primarily the educationally and economically disadvantaged, the handicapped, ethnic minorities, and women. As educational changes are considered and made in States and localities, the Federal role could be to ensure that those changes were equitable for all students.

Finally, the President and others have attributed the educational problems in part to the current level of Federal involvement. They posit that the appropriate Federal response is to reduce that involvement. It should be noted that none of the reports reviewed in this brief calls for a reduced Federal role in education.

Since the release of A Nation at Risk by the National Commission, Federal action in both the executive and legislative branches has consisted of drawing attention to the problems in education and to certain of the recommended changes, and initiating relatively small incentive programs.

The Department of Education sponsored a series of regional conferences on the Commission's report that culminated in a "National Forum on Excellence in Education" at the beginning of December 1983. The Secretary of Education has awarded some of his discretionary funds to a number of projects for work related to the Commission's various recommendations. The Secretary has also sponsored efforts to identify outstanding secondary schools, in part to acknowledge their achievements and also to encourage other schools to follow their lead.

In January 1984 and December 1984, the Secretary issued charts comparing the States on a number of educationally related factors (change in college entrance test scores, graduation rates, teachers' salaries, current expenditures for education per pupil, etc.). The Department also issued "Indicators of Education Status and Trends" in January 1985 intended to describe the "health" of American education. It provides data on educational _outcomes_ (test scores, graduation rates, activities of graduates during the first year after high school, etc.), _resources_ (expenditures per pupil, a fiscal effort index by State, class sizes, verbal SAT scores of teachers, etc.), and _context_ (public opinion, a need index for students by State, State-required Carnegie units in certain subjects, etc.).

The President has endorsed the concept of merit pay for teachers as an appropriate response to some of the nation's educational difficulties and has drawn attention to the possible impact of student discipline problems on academic excellence.

The 98th Congress took a number of actions with regard to this current reform effort. It approved legislation authorizing the following: math and science instruction aid (Education for Economic Security Act, P.L. 98-377), an Excellence in Education program (P.L. 98-377) providing funds to local educational agencies for reform activities, higher education scholarships with a teaching service requirement for outstanding high school graduates (Carl D. Perkins Scholarship program, Human Services Reauthorization Act, P.L. 98-558), one-time financial awards to exceptionally able high school graduates attending postsecondary education (Federal Merit Scholarship program, P.L. 98-558), fellowships to outstanding teachers (National Talented Teacher Fellowship program, P.L. 98-558), a program to enhance the leadership skills of elementary and secondary school administrators (Leadership in Education Administration Development Act of 1984, as authorized in P.L. 98-558), and the convening of a conference on education (National Summit Conference on Education Act of 1984, as authorized in P.L. 98-524). Before its adjournment, the 98th Congress had only appropriated funds for math and science aid ($100 million) and funds for an Excellence in Education program ($5 million). (It should be noted that the FY86 budget proposes the rescinding of these funds because, according to the Administration, they duplicate other ongoing Federal education programs.) Several sets of hearings by House and Senate committees and subcommittees on the question of educational excellence also have been held. In addition, the House Education and Labor Committee's Merit Pay Task Force released a report recommending experiments in merit pay programs for teachers along with increases in all teachers' base salaries.

LEGISLATION

The bills listed below are among those introduced in the 99th Congress to establish or continue programs addressing elementary and secondary school reform.

H.R. 650 (Hawkins)

American Defense Education Act. Authorizes funding for local educational agencies to undertake an assessment of instruction and student achievement, and to carry out plans to improve instruction and achievement in math, science, communication skills, foreign languages, technology, and, where necessary, guidance and counseling. Local agencies would be eligible for Federal payments based on a formula using the Statewide average per pupil expenditure. Authorizes grants to institutions of higher education for activities to improve science and math education. Among the approved activities would be summer institutes and workshops in math and science for teachers and supervisors from local educational agencies, projects to increase the capacity to address the professional needs of new and practicing teachers, and assistance for exemplary projects to attract, retain, and motivate teachers to pursue careers in precollege math and science education. Authorizes surveys and a joint report by the Secretaries of Defense and Education concerning educational needs to meet military manpower requirements. Introduced Jan. 24, 1985; referred to Committee on Education and Labor.

H.R. 747 (Hawkins)

Effective Schools Development in Education Act of 1985. Amends the Elementary and Secondary Education Act by inserting a new title authorizing funding for State and local educational agencies to support effective schools programs. Applicants for these 1- to 3-year grants must have an effective schools improvement program in operation, and must meet at least half the cost of any activity conducted with Federal funds. In selecting applicants for funding, the Secretary of Education is to consider the extent to which funds would be used to improve schools in districts with the greatest numbers or highest percentage of educationally deprived children. An effective schools program is defined as a program to promote school-level planning, instructional improvement and staff development; and to increase academic achievement of educationally deprived children through early children education programs and the use of factors distinguishing effective from ineffective schools. These factors are defined as strong and effective leadership; emphasis on basic and higher order skills; safe and orderly environment; belief that virtually all children can learn; and continuous assessment of students and programs. Authorizes $100 million for FY86, $110 million for FY87, $120 million for FY88, and such sums as may be necessary for FY89 and FY90. Introduced Jan. 28, 1985; referred to Committee on Education and Labor. [Similar bill: S. 1237 (see below).]

H.R. 901 (Williams et al.)

Secondary School Basic Skills Act. Authorizes grants to local educational agencies with especially high concentrations of low-income youth for more effective instruction in basic skills for economically disadvantaged secondary school students. Secondary schools are eligible for funding if 20% or more of their students are considered low-income under provisions of Title I (compensatory education for disadvantaged students) of the Elementary and Secondary Education Act, or are eligible for a free lunch under the National School Lunch Act. If, after two years of funding, the recipient does not demonstrate improved academic performance by the targeted secondary school students or meaningfully decrease its drop out rate, no additional funds can be granted. A one-year waiver is possible. Authorizes $900 million annually for FY86 through FY91. Introduced Jan. 31, 1985; referred to Committee on Education and Labor.

H.R. 937 (Wyden)

Teacher Warranty Act of 1985. Amends the Higher Education Act to provide that institutions participating in the Title IV student assistance programs authorized by the Higher Education Act must retrain any graduate of their education schools who receives an unsatisfactory evaluation in his or her first or second year of teaching. The graduate will be required to pay only the amount by which such retraining costs exceed the amount of Title IV assistance the graduate received while in attendance at the institution. Introduced Feb. 4, 1985; referred to Committee on Education and Labor.

H.R. 1352 (William Ford)

Professional Development Resource Center Act of 1985. Authorizes grants to local educational agencies or consortia of such agencies to assist in the planning, establishing, and operating of professional development resource centers for teachers. Such centers are to improve teaching skills through activities such as developing and disseminating curricula, training teachers, and disseminating information. The Secretary of Education can grant 10% of the funding to institutions of higher education to operate such centers. The Secretary is to ensure that at least one center in each State will be funded each year. Such sums as may be necessary are authorized for FY86 and the succeeding four years. Introduced Feb. 28, 1985; referred to Committee on Education and Labor.

H.R. 2364 (Rahall)
Amends the Elementary and Secondary Education Act of 1965 by inserting in Title IX a new Part A entitled Gifted and Talented Children's Education Act. Although similar to S. 452 (see below), the bill does differ in some important respects. For example, its annual authorization level is lower, $40 million for each year in the FY86-FY90 period. Introduced May 6, 1985; referred to Committee on Education and Labor.

H.R. 2535 (Goodling)
Even Start Act. Authorizes support for model adult basic education programs that include activities enhancing parents' ability to prepare their children for school and to provide an educationally supportive home environment. To fund these programs, the Secretary of Education is to reserve annually $1 million from the Adult Education Act and $2 million from Chapter 1 (compensatory education for disadvantaged children) of the Education Consolidation and Improvement Act of 1981 for the period FY87 through FY91. Grantees must provide 25% of program costs in the third year of any program, 50% in the fourth year and continue to operate any effective program thereafter. Introduced May 16, 1985; referred to the Committee on Education and Labor.

H.R. 2557 (Dymally)
Adds a new title to the Higher Education Act to foster school year and summertime partnership between higher education institutions and secondary schools serving low-income students. Among the kinds of activities such partnerships can undertake are programs in which college students tutor high school students in basic skills; programs to improve specific subject matter understanding by high school students; and programs to enhance the opportunity of high school students to continue their education after graduation or to secure post-graduation employment. The bill authorizes $40 million for FY86 and such sums as may be necessary for FY87 through FY90. Federal funds can meet only a portion of any program costs (70% in first year, 60% in second, 50% in the third and subsequent years). Introduced May 21, 1985; referred to Committee on Education and Labor. [Similar bill: S. 1237 (see below).]

H.R. 2840 (Hawkins)
School Excellence and Reform Act. Authorizes general improvement and excellence payments and reform and equity payments to State and local educational agencies under specified allocation formulas. General improvement and excellence payments are to be used for attaining educational excellence and for improving math, science, communication, foreign language and technology instruction. Reform and equity payments are to be used for early childhood education, day care, in-service teacher training, dropout prevention, effective schools and improvement of secondary school basic skills instruction. Authorized funding level for FY87 is $2 billion to be divided evenly between the two kinds of payments. Such sums as may be necessary are authorized for the following four fiscal years. Introduced June 21, 1985; referred to Committee on Education and Labor.

S. 177 (Hart et al.)
American Defense Education Act. Similar to H.R. 650. Introduced Jan. 3, 1985; referred to Committee on Labor and Human Resources.

S. 204 (Bumpers et al.)

Humanities Excellence and Teacher Training Act of 1985. Authorizes grants to institutions of higher education for summer institutes to enhance the subject matter skills of private and public elementary and secondary school humanities teachers. The humanities are defined as modern and classical languages, literature, history, and philosophy. Language arts and social studies are included for elementary school instruction. An approved applicant is to receive an amount equal to not more than $3,000, multiplied by the number of teachers (up to 200) enrolled at such institute. Stipends are to be paid by each institute to participating teachers. There is to be at least one institute in each State. Introduced Jan. 21, 1985; referred to Committee on Labor and Human Resources.

S. 452 (Bradley et al.)
Amends the Elementary and Secondary Education Act of 1965 by inserting in Title IX a Part A entitled Jacob J. Javits Gifted and Talented Children's Education Act. This part authorizes funding to State educational agencies for planning, developing, operating, and improving educational programs for gifted and talented children. A portion of the annual appropriation is to be used by the Secretary for discretionary programs. For most projects, the Federal share of costs is to be 90%. The annual authorized appropriation for the period FY86-FY90 is $50 million. Introduced Feb. 7, 1985; referred to Committee on Labor and Human Resources. [Similar bill: H.R. 2364 (see above).]

S. 508 (Bradley et al.)
Secondary School Basic Skills Act. Similar to H.R. 901. Primary differences are the authorized funding level ($100 million a year for FY86 and FY87, $800 million a year for FY88-FY92); the determination of secondary school eligibility (at least 10 poverty-level children aged 14 to 17 as defined under Title I of the Elementary and Secondary Education Act); and kinds of grants authorized (planning, demonstration, and formula grants). Introduced Feb. 26, 1985; referred to Committee on Labor and Human Resources.

S. 553 (Domenici)
Education for Economic Security Reauthorization Act. Extends the funding authority for the Education for Economic Security Act (enacted by 98th Congress to improve math and science education at the elementary and secondary school level) through FY88. Introduced Feb. 28, 1985; referred to Committee on Labor and Human Resources.

S. 1022 (Levin et al.)
Intergenerational Education Volunteer Network Act of 1985. Authorizes assistance to programs using senior citizens as volunteers in schools to improve students' basic skills, to improve communication between schools and families with educationally disadvantaged children, and to increase those families' participation in their children's education. The bill authorizes $6 million for FY86. The annual authorization rises in stages until it reaches $10 million in FY90. Introduced Apr. 26, 1985; referred to Committee on Labor and Human Resources.

S. 1237 (Dodd)
Children's Survival Act. Authorizes programs for children, adolescents, and families in areas such as child care, health, education, nutrition, family support, and youth employment. Title IV of the Act expands the authorized funding levels for a number of programs including Chapter 1 (compensatory education for disadvantaged children) of the Education Consolidation and Improvement Act of 1981 and for the Bilingual Education Act. Title IV also authorizes a series of new programs including early

childhood incentive grants; the Dropout Prevention and Recovery Act of 1985 (establishes a nationwide system to report dropout information to State educational agencies and the Secretary of Education); the Effective School Development in Education Act of 1984 (similar to H.R. 747, see above); and a program to support university-high school partnerships (similar to H.R. 2557, see above). Introduced June 4, 1985; referred to Committee on Finance.

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Barriers to Excellence: Our Children at Risk

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Discrimination and Differential Treatment: The Risk to Children

The National Coalition of Advocates for Students (NCAS) is a network of experienced child advocacy organizations that work on public school issues at the federal, state and local levels.

Our schools have changed significantly in the 30 years since *Brown vs. Board of Education of Topeka* (1954). Schools now enroll more Blacks, more linguistic and cultural minorities, and more students with handicapping conditions than ever before in our history. Further, a large proportion of these new groups of students come from low income families. Yet, the education of too many of these students is characterized by low expectations, inferior resources, and differential treatment. The doors to schools have been opened, but hanging above those doors are signs that say: "Enter at your own risk. You may not belong here."

We found over and over again in our inquiry that subtle forms of discrimination still exist in schools. We learned about the daily practices and institutional mechanisms that undermine students' self-esteem and work to push students out of school altogether. One young witness in New York offered this description of her experiences in high school:

> *I hated the school. It was overcrowded; teachers didn't care; students walked out and acted up and no one did anything to help the situation. I never knew who my counselor was, and he wasn't available for me. In the year that I attended, I saw him once about working papers. One 10-minute interview period. That was all. After awhile, I began spending my time sleeping in class or walking the halls. Finally, I decided to*

> *hang out on the streets. I did this for two years. During this entire time, I received about three cards in the mail asking where I was. Luckily, I always got the mail before anyone in my family did. That was it. End of school.*[1]

This young woman's school did little to ensure that her right to an education became a reality. Nor did her school help her believe in herself and her possibilities or give her skills she needed. By the time many young people like her have completed nine or ten years of schooling, they see little reason to continue. They are indeed getting the message that "you don't belong here."

Many low-income and minority youth attend school with powerful hopes and dreams sustained by their parents' fierce desire to see them succeed. In the words of a social service worker in New York: "The poor in America have only one legal option to escape poverty and the problems associated with being poor. That option is education."[2] It takes a lot to make students give up their only "legal option." Dreams of equal opportunity and access to a good life die hard. But when students confront the realities of active exclusion and neglect that exist in many schools, those dreams begin to unravel.

Historically, discriminatory conditions have outraged parents, students, and communities, and have been the impetus for intense campaigns to breathe life into the American dream of opportunity through education. A parent in the Cleveland, Ohio, public schools concluded her testimony:

> *Countless children in Ohio don't receive what they deserve from the schools they attend. And because they don't, they suffer. They suffer humiliation, because far too often* they *are blamed for not learning, even though they're stuck in a situation where the deck is stacked against them. They suffer lifelong poverty, for they're not equipped to break out of the cycle which keeps them poor. They suffer the incredible frustration of goals never met and dreams never realized. And we continue to ignore the overwhelming toll of human suffering that is paid each day that we fail to act to correct these . . . inequities.*[3]

Throughout our inquiry we felt an increasing sense of anger and frustration at the wastefulness of our schools. Our schools are discarding too many young people; our society is losing too much potential. It is a waste we cannot afford and must refuse to tolerate.

Coincidentally, we reached the mid-point of our study at the same time that reports about the "tidal wave of reform" sweeping the nation's schools began to appear widely in the national press.[4] From that time on, many students, parents, educators, and advocates who came to our hearings expressed frustration that these reports of school reform paid little attention to issues of educational access and equity. For these witnesses, no talk of reform was responsible without a commitment to high quality education for students with limited English proficiency and handicapping conditions and without a pledge to promote compensatory education services, desegregation, equitable allocation of resources, and sex equity within our schools.

Policymakers at many different levels talk of bringing excellence to the schools and ignore the fact that hundreds of thousands of youngsters are not receiving even minimal educational opportunities guaranteed under law. In the current climate of educational reform, many observers have assumed that past legislative actions have achieved access and equity for students in our schools. With these matters taken care of, they believe, we can now turn attention to the distinct and separable issue of quality.

All of the parents, advocates, students, and school practitioners who spoke with us realize that existing legal mandates supporting access and equity only lay the groundwork for change. They know that concerted efforts to implement the intent of these mandates must continue if we are to turn the promise of educational opportunity into services and programs that meet student needs and raise student achievement. And they told us often that these mandates are being compromised.

In this chapter we focus on each of the groups of students who are most at risk of not receiving a high quality education;

we present testimony and research relating to low-income, Black, cultural minority, female, and handicapped students. We document the forms of discrimination that jeopardize each of these groups. We also discuss the erosion of major reform efforts intended to reverse these harms.

Class Discrimination

"Chemistry in a poor school is virtually a different science from chemistry in a rich school."[5]

It is still true in America that the income level of a child's family is a major determinant of the quality and quantity of education that child receives.

- The average child from a family whose income is in the top quarter of the income range gets four years more schooling than the average child whose family income is in the bottom quarter.[6]
- Many school districts allocate substantially fewer dollars to schools in poor and minority neighborhoods. The disparities among schools within a district are often just as great as the gap between low-income urban and rural districts and affluent suburban districts within the same state.[7]
- Studies of classroom interactions reveal significant differences in teacher expectations and behavior towards students based on the social class of the students.[8]
- Of the more than 40 million public school students, between 20 and 25 percent were eligible for Title I programs in 1980-81. Only about half of those eligible actually received services.[9]

From the minute they walk into school, many low income students get the message that society does not really care about their education, that schools expect little from them. The combined impact of decaying physical plants and a scarcity of classroom materials and educational resources undermines their motivation and self-esteem. Such is the discouraging picture of the schools which many students, parents, and teachers presented to us. A teacher in New York related this portrait of conditions confronting him and his students:

> *We have not had working bells since December 1982. This has had a disastrous effect on a system coordinated by bells. The student restrooms, when working at all, did not have functioning sinks over several years . . . shades are impossible to obtain. Paint is peeling . . .* [10]

In Massachusetts, one teacher reported to us that when she tried to get enough textbooks for all of her students, she was told to have students share the books because half her class will leave anyway. Still another teacher, whose job it is to teach writing, told us of her school's policy to hand out half-sheets of paper to students, no matter what the assignment. 6 She did not understand how she could expect her students to complete serious writing assignments if the initial message to them was they would not have more than a half-page worth to say. Science equipment, we learned, is obsolete or nonexistent in many of the schools serving large numbers of at-risk students.[11]

Expectancy as a belief or prediction of children's success or failure has a real effect on how well they do.

It is more than unequal resources that makes educational quality so different for children of different income groups. In our hearings, we heard about daily, entrenched practices which discourage low-income students and undermine their self-esteem and ultimately their performance in school. These practices are harder to measure than such factors as dollars per student, but they are key to our understanding of the damage that results. As one Boston parent commented:

> *There is a genius in every one of us, but if we keep telling our kids they are dummies, by middle school they will feel dumb.* [12]

Her comments were underscored by the testimony of an expert on expectancy research who reminded the panel that:

> *Expectancy as a belief or prediction of children's success or failure has a real effect on how well they do . . . .* [13]

A number of key studies have highlighted the dramatic impact of teacher expectations on performance of students in the classroom. Research has documented the special potency of class background, as well as race, in determining teachers' perceptions of and behaviors toward children. According to these studies, teachers often adjust educational goals, teach different material, and reward or punish behavior differently by class as well as race.[14]

A key finding from expectancy studies is that teachers of low-income children tend to emphasize rote learning and minimize discussion and interaction on cognitive issues. They display little tolerance when low-income children ask questions that are "beside the point." Middle-income children, on the other hand, tend to have their questions taken more seriously. One study documented a first grade classroom in which the teacher divided lower and middle-class students into ability groups that reflected social-class differences perfectly and then taught according to the different approaches described above.[15]

Such early differential treatment has a long-term effect on a student's schooling. First or second grade children who are tracked by teachers' judgments of reading and arithmetic ability or by some testing mechanism will likely remain in the assigned track for the duration of their schooling.[16] In the current climate of educational reform, low expectations for and differential teaching of low-income students also place them in considerable jeopardy. As an expert witness on this subject reminded us: "High expectations are being confused with high standards, which children are dared to jump over."[17] If schools set high standards and simultaneously communicate to students that they do not believe they can meet those standards, many children will certainly fail. This is, in fact, a self-fulfilling prophecy.

Other studies show a strong positive relationship of low income both to low scores on IQ tests, grades, and college entrance examinations, such as the Scholastic Achievement Test (SAT), as well as to the cumulative years of schooling attained.[18] Most Americans prefer to believe that America's uniqueness as a society is its ability to reward people for their talent and ability. Consequently, this correlation is often ignored in public policy debates. When it is addressed, policymakers often blame deficiencies in family life styles for both low income and low achievement.

Vast numbers of low-income children performing below grade level were a cause of public concern during the War on Poverty of the mid-1960s. Title I of the Elementary and Secondary Education Act of 1965 made federal dollars available for compensatory education services in reading and math for these children, and targeted funds specifically to schools serving large numbers of children from low-income families.

By 1980, Title I provided compensatory education services to over five million children, 70 percent of whom were in elementary schools. Over half the students served were White, nearly a third Black, and the rest "Spanish surnamed," or other.[19] Yet, even at the peak of federal support and enforcement, less than half of those eligible were served.[20] Since 1981, overall services have been reduced. In real dollars, the program has suffered a 20 percent cut in funding.[21] Even fewer children in need of services are being helped.

This erosion has occurred despite research findings which indicate that the Title I Program contributed to the improvement of educational achievement for low-income students and reversed the impact of low expectations, inferior materials and resources, and overcrowded classes. In addition to evidence of achievement gains gathered in Title I evaluations, the National Assessment of Educational Progress in 1981 showed dramatic increases in reading scores for disadvantaged students over the past ten years. Most impressive were reading level gains among Black elementary school-age and 13-year-old students, which reduced the gap between Black and White students by 40 percent. Reading experts cited federal aid for reading instruction in elementary schools as a vital factor in these gains. Similar patterns were evident in mathematics.[22]

A serious commitment to closing the gap between low-income and high-income students demands the expansion of Title I. Every eligible elementary school child should have access to this program. In addition, the program should be available in more secondary schools, where the challenge of adapting to diverse student populations has not been adequately met. However, in the past several years, decision-makers have chosen to ignore both the success of this program and the educational needs which continue to require attention. Instead, under the "new federalism," Title I aid was collapsed into Chapter I of the Education Consolidation and Improvement Act of 1981. Chapter I weakened targeting requirements, removed previously required parent advisory councils, eliminated many other accountability requirements, and substantially reduced federal monitoring and enforcement. As the Children's Defense Fund noted in its 1984 "Children's Defense Budget":

> *It took 17 years and nine major amendments to Title I to create a system at the federal, state, and local levels that could safeguard the educational benefits of remedial instruction for low-achieving children in low-income neighborhoods. Now legislative and regulatory changes, budget cuts, and the Department of Education's low profile threaten to destroy the carefully woven fabric of this program.*[33]

Title I was never enough, but it was a constructive attempt to reduce high correlations between standard measures of educational success and family income of students. It implied a concern for fairness inherent in our system of public education.

Racial Discrimination

"The* Brown *decision was the first step in an extended lay-away plan that has yet to eliminate the vestiges of past discrimination or dismantle completely the system of dual public education. . . . Quality integrated education remains a goal."[34]

Thirty years after the Supreme Court declared that the doctrine of "separate but equal" had no place in schools, racial discrimination remains a serious barrier to quality education for Black children.

- 62.9 percent of Black students attend predominantly minority schools.[25]
- Only 8.5 percent of all teachers are minorities.[26]
- Black children tend to drop below grade level expectations in elementary school and fall further behind as they get older.[27]
- At the high school level, Blacks are suspended three times as often as whites; while minority students are about 25 percent of the school population, they constitute about 40 percent of all suspended and expelled students.[28]
- The national drop-out rate for Blacks in high school is nearly twice that of whites.[29]
- Black students are more than three times as likely to be in a class for the educable mentally retarded as White students, but only half as likely to be in a class for the gifted and talented.[30]

Such statistics create a composite portrait of inequality and discrimination in the education of Black Americans.

In Atlanta, where we convened a hearing on the thirtieth anniversary of the *Brown* decision, witness after witness told how current reality has fallen short of their hopes and ideals. May 17, 1954, was, in the words of the Southeastern Regional Director of the NAACP, "a day of jubilee for Black Americans."[31] It was viewed as a crucial victory not only in the struggle to obtain equal access to quality education, but also as a necessary step to first-class citizenship, to the end of segregation, Jim Crow, and denial based upon race.

Thirty years later, segregation by race and social class continues to define housing patterns in most parts of our country, and equal employment opportunity remains only a dream. While desegregation efforts in the schools have been somewhat more successful, resulting in improved educational opportunity for many Black students and achievement gains for Black and White students, progress has been much too slow, and, in many places, change has been arrested altogether. As the Chairman of the Southern Christian Leadership Conference Task Force on Education said in his reappraisal of the past three decades: "We did not understand that neither desegregation nor integration is a guarantee of equal access to education, or the elimination of discrimination. . . ."[32]

Official policies and practices that result in significant resegregation in our nation's schools have undermined 30 years of efforts on behalf of desegregation. The most comprehensive description of resegregation was provided to us by representatives of a Task Force in Champaign, Illinois, that had been given a mandate to study the educational status and needs of Black youth in that community. Interpreting this mandate broadly, the group investigated cumulative effects on Black students of resegregation occurring inside schools and the continuing lack of employment opportunities outside schools. The education of Black children, they told us, suffers from:

> *. . . their virtual noninvolvement in school activities; underrepresentation in programs for the gifted and overrepresentation in special education; disproportionate discipline referrals, resulting in suspension and expulsion; interactions with some staff members who do not know or exhibit appreciation of values inherent in Black culture; interactions with many staff members who communicate low expectations for their behavior and achievement; and, the destruction of hopes that comes from living in a community in which Black unemployment is high and a general feeling exists that adult opportunities for success are limited.*[33]

We heard about desegregated schools in which tracking and sorting policies...resulted in upper level courses that are 90-100 percent White and lower level courses that are 90-100 percent Black.

Throughout the country, Black parents, educators, and advocates provided illustration after illustration of these grim realities. Ostensibly fair policies, we were told, often resulted in differential treatment and unfair outcomes. We heard about desegregated schools in which tracking and sorting policies, based on grades, test scores, student selection, or a combination of these criteria, resulted in upper level courses that are 90-100 percent White and lower level courses that are 90-100 percent Black.[34] Such situations contradict the meaning of a desegregated education.

Of particular concern to many of those who spoke with us were disciplinary practices and policies that result in punishment and suspension of disproportionate numbers of Black students. Too many teachers and administrators, our witnesses told us, expect that Black children will cause discipline problems. The result, as a witness from the Long Island Advocacy Center pointed out, is the "prevalent attitude that while troublesome Black students do not belong in the district, troublesome White students can be handled."[35] Given this attitude, it is easy to see how small incidents can quickly escalate into large problems.

Disciplinary policies at many schools contain vague terms and do not separate serious offenses, involving violent behavior, from "trivial-but-aggravating" ones, such as students chewing gum, or coming late to class.[36] Usually, it is the teacher who interprets student behavior and that interpretation may be racially biased. Administrators who receive these classroom referrals from teachers too seldom question them. Judgments about appropriate school behavior, on the part of both teachers and administrators, are influenced strongly by the values of the dominant culture. The dean of a high school in Rochester, New York, who had become involved in a study of disproportionate suspension of Black males, reported, for example, that in Rochester a hair pick was considered a potential weapon. Thus, students who were carrying a pick in school could be suspended.[37]

Cultural assumptions may also lead to misinterpretations of student behavior. For example, some teachers, we were told, become angry if students do not look into their eyes when they are talking to them, but Black students may have been taught at home that respect is shown by looking down or away. As a superintendent in southern Louisiana pointed out: "The disrespect white teachers read into the actions of Black students may not have been that at all."[38]

The Chairperson of the Project to Monitor the Code of Discipline in Boston, Massachusetts, reported that during the first two years of the new discipline code, a disproportionate number of those suspended were Black, mostly for being "disruptive" in a class.[39] The use of such difficult to define terms in discipline codes means that many different behaviors are open to broad interpretation as punishable offenses. The result is that minority students are suspended far more often for discretionary or "friction" offenses than their majority peers.

It became clear to us in our inquiry that suspensions are used extensively in some schools with little evidence that this is an effective technique for encouraging good discipline. This practice also raises questions about how seriously schools value academic instruction. Students who are not in class can hardly keep up with an academic program. The detrimental effect on the education of a student who is suspended is obvious. One Boston parent told us:

> *Suspension means kids are outside on the street, ready to fight. It makes no sense, for example, to suspend a kid for alcohol or drugs and then offer no alcohol or drug program in the school.*[40]

The use of suspensions in public schools is frequent, but few suspensions are for dangerous behavior.[41] From our witnesses we learned of school districts in which out-of-school suspensions are frequently used for class cutting, tardiness, and truancy, despite the fact that this punishment does little, if anything, to deal with those symptoms of limited motivation. A witness who works with truants in New York City stated the suspension issue quite simply: "The more days of school one misses, the further behind one gets, and the harder it is to go back and keep going back."[42] Suspension is not an appropriate or effective tool for breaking this cycle. Yet, in many communities, those students who already feel most alienated from the school environment are told to stay out.

In practice, the proportion of disciplinary referrals and suspensions for Blacks are often highest in newly desegregated schools. As was noted in the comprehensive Vanderbilt University study of desegregation:

> *The increase in minority suspensions following desegregation may occur in part because minority students are more often moved into previously white schools than white students are moved into previously minority schools. Minority students are thus required to adapt or to assimilate into a different culture.*[43]

The consequence may be that these students feel unwelcome in an educational environment in which they are neither respected nor fully included.

By the simple act of enrollment in public school, Black children are placed at risk of being inappropriately labeled mentally retarded.

Misclassification of large numbers of Black students into special education classes for the mildly mentally handicapped was also of concern to our witnesses. The same dynamic identified with "handling Black students" that we found to underlie discriminatory discipline also contributes to the removal of a disproportionate number of Black students from regular classrooms and their overplacement in special classes. As one witness put it, the operating procedure in many schools seems to be "if we can't control, we sort out."[44]

By the simple act of enrollment in public school, Black children are placed at risk of being inappropriately labeled mentally retarded. Nationally, Black students, most of them male, are placed in classes for the mildly mentally retarded at a rate more than three times that at which white children are similarly placed.[45] This is a serious matter, for labeling a child retarded permanently alters that child's status before society, profoundly limiting opportunities for future education and employment. One careful study of children in classes for the educable mentally handicapped (EMH) showed that many had no serious intellectual deficit but had been placed in such classrooms because they created discipline problems within the regular program.[46] We fear that in many schools, a system created to aid students with special learning needs is being subverted into a mechanism for race discrimination.

When student populations in such categories as "emotionally handicapped," "educably retarded," "learning disabled," "speech impaired," and "neurologically impaired" are analyzed, a dramatic over-representation of Black students is discovered.[47] Although full parental understanding and involvement in the classification process is legally required under federal regulations, the parent of a formerly misclassified child in Chicago described a quite different reality:

> *I was told that my boy would be tested to see where the teacher needed to start working with him. I was never told that he was to be placed in a class for the mentally retarded.... That blue slip is really a one-way ticket to emotional and educational death for many children. It says to a child 'you are retarded.' It says to a child, 'you are lost.'"*[48]

At the same hearing, the chairperson of the Council for Disability Rights in Chicago pointed out that research on mental retardation indicates "if non-discriminatory testing methods are used, no more than 1.25 percent of any racial group will end up being classified as EMH."[49] Yet in 1980, the national rate for assignment of Black students to classes for the mentally retarded was 3.35 percent, the same as it was in 1970.[50]

Throughout our inquiry we were struck by the gap between the discriminatory practices and policies that exist in many of our schools and the models of fair disciplinary codes and nondiscriminatory assessment procedures that some administrators, teachers, and advocates have developed and tested. We know that if fairness for all students exists in some schools, fairness can exist in all schools. If more school systems adopted such models, some of the immediate harm being done to Black students could be reversed. The wide gap between what is known and what is used leads many members of our Board to share a conclusion drawn by one Black parent who spoke with us:

> *There is no doubt in my mind that the main reason that our children are overlooked and discriminated against by denying them the right to a quality education is the racism that exists in this country.*[51]

Cultural Discrimination

"To keep a people ignorant of the most precious part of their heritage is to debilitate people."[52]

Students whose cultural and linguistic backgrounds are different from the dominant culture of the society do not yet have full access to quality education. As the public school population changes to include an increasing percentage of students who speak a first language other than English, cultural discrimination undermines the education of more and more children in our public schools. Although the overall extent of cultural bias in the schools is difficult to measure, there are a number of indicators that underline the seriousness of the problem.

- Only about one-third of the estimated 2.7 million limited English proficient students aged five to 14 receive any form of special programming responsive to their linguistic needs.[53]
- In 1980, only 10 percent of Hispanic children with limited English proficiency were in bilingual programs.[54]
- Studies conducted in urban high schools have revealed dropout rates as high as 85 percent for Native Americans, and between 70-80 percent for Puerto Rican students.[55]
- Many textbooks remain culturally biased, both in their presentation of material and in their omission of material on the culture, history, or achievement of many of the national and cultural groups represented in our schools.[56]
- Nearly 25 percent of all public school teachers in the United States had students with limited English proficiency in their classes in 1980-81; but only 3.2 percent of those teachers said they had the academic preparation or language skills to instruct their LEP students.[57]

The operating assumption in many schools we heard about is that different backgrounds and languages constitute deficits to be corrected, rather than strengths upon which to build. Many administrators and teachers neither understand nor appreciate cultures different from their own. According to several of our witnesses, multicultural education is often nothing more than making masks and celebrating holidays.

Furthermore, many school systems are unable or unwilling to implement affirmative action policies that would diversify the teaching and administrative staff, including persons more representative of the racial and cultural minorities served by the schools. As a school desegregation officer said in Boston: "We must have multicultural models in the schools if we are to shatter the myth of minority inferiority and white superiority. . . . Children have to function in a multi-cultural world."[58]

Surprisingly, few school systems have made significant investments in revising curriculum to reflect the variety of cultures in the nation and in the world. Witnesses told us of Native American children sitting through lessons about "taming the frontier" and of Columbus "discovering America"; of world history texts which devote no more than a few paragraphs to Africa; of Asian history courses that treat "all Japanese, Chinese, and Filipino people, whose histories are all different and all need to be told" as if they were one; of schools in the Southwest which teach the history of their region with little more than a cursory look at its rich pre-Anglo culture.[59] Such accounts reminded us again and again of how devastating it can be for students to attend schools which "disconfirm rather than confirm their histories, experiences, and dreams."[60]

The high drop-out rate among cultural minority groups is an indicator of the degree to which our schools are failing to meet the needs of cultural and linguistic minority students. The national drop-out rate for Native Americans, for example, averages 48 percent. However, drop-out rates as high as 85 percent have been documented for Indians attending urban—so called assimilated—schools.[61] In Lansing, Michigan, representatives of the state's Native American communities investigated why so many Indian children fail to complete their schooling. Their findings describe multiple forms of discrimination experienced by these children:

> *. . . some counselors have discouraged Indian children from either staying in school or returning to school after dropping out . . . some teachers are not sensitive enough in dealing with and understanding the Indian culture and values, and convey the message, either knowingly or unknowingly, that Indian children do not belong in the classrooms . . . some teachers simply ignore Indian children in the classroom and have little concern over their attendance and school work.*[42]

This lack of respect, along with a disregard for students' languages and cultures in many schools enrolling Indian students both on and off reservations are contributing to the disappearance of tribal languages and identity. At the same time, they are having a devastating effect on school achievement and retention. To continue to ignore such issues is not acceptable.

In Chicago and New York, studies of several predominantly Puerto Rican high schools have revealed attrition rates of 70 to 80 percent.

Accurate national statistics on drop-out rates of other cultural minorities are difficult to obtain. We were reminded by a number of witnesses in San Antonio, Chicago, and Seattle that such cultural/linguistic categories as "Hispanic" or "Asian," which schools use to collect vital information on student enrollment, attendance, discipline, achievement and retention, obscure the reality of what is happening to those most at risk. A 45 percent drop-out rate for "Hispanics," for example, may be a 70 percent drop-out rate for Puerto Ricans in the district, averaged with a 20 percent drop-out rate for Cubans or other Spanish speaking peoples. In Chicago and New York, studies of several predominantly Puerto Rican high schools have revealed attrition rates of 70 to 80 percent.[43]

The lack of bilingual education is another symptom of our schools' failure to address the needs of cultural and linguistic minorities, and was of particular concern to the Puerto Rican, Indian, and Chicano parents and educators who spoke with us. As the President of the National Association for Bilingual Education said in our Southwest hearing:

> *Many schools are not assessing the special needs of language minority students. They are not assessing the English language proficiency of these children, much less the home lan-*

> *guage proficiency, as a basis for planning programs and providing services.*[64]

This witness also testified to measurable educational gains for students with limited English proficiency who are exposed to well-implemented bilingual programs:

> *These gains, documented in local and statewide evaluations, include improved academic achievement, reduced rates of school drop-out and student absenteeism, increased community involvement in education, and enhanced student self-esteem.*[65]

An account of the value of such programs was provided to us by the former principal of a school in New York who was of Puerto Rican background. Working with a group of parents, he had instituted a program in which both Spanish and English were used for instruction purposes:

> *School absenteeism was reduced; our pupil holding power increased. If I had had this opportunity as a child, my parents could have been helpful to me in my early formative school years—certainly I would have been proud of my heritage then. . . surely my teachers and parents would have discussed my growth without me as the translator. . .*[66]

An Assistant Superintendent in Holyoke, Massachusetts told us of a pilot program in "two way bilingual education" which was successfully increasing educational access for limited English speaking students and providing an opportunity for English speaking students to learn a second language and learn about another culture.[67] A similar "bilingual-bicultural" program was described to us by an advocate from Center, Colorado. The result there too had been increased achievement for all students in the school.[68]

The paucity of bilingual education programs indicates how far most school districts are from viewing the diversity of student languages and cultures as a potential strength for the students themselves and a resource for the school community as a whole. As one Board of Inquiry member pointed out during a group deliberation, "Students who speak Spanish are viewed as having a disease that must be treated."[69] Indeed, many states and school districts have made neither adequate financial nor programmatic commitments to bilingual education. Even where programs exist, they are underfunded and understaffed, and sometimes staffed with teachers who are not proficient in the native languages of the students. The result, as one parent in Boston told us, is that "our children do not learn Spanish or English."[70]

At a time when we perceive widespread public agreement with the national call for "every American public school student to have the opportunity to acquire proficiency in a second language,"[71] it is particularly ironic to find a wavering public commitment to bilingual education. Foreign language learning is seen as a privilege sanctioned for White college preparatory students, but knowledge of a foreign language is considered a liability for students who do not speak English at home. As one Puerto Rican administrator said to us: "The only ones that will emerge from the schools biljngual are the Anglo children. A natural language resource will be lost."[72]

The federal role in support of bilingual education has been ambiguous at best. The Bilingual Education Act of 1968 (Title VII of the Elementary and Secondary Education Act) provided funds to school districts to establish model bilingual education programs, on a voluntary basis, that responded to linguistic and cultural differences of children with limited English proficiency, most of whom were Hispanic. These programs continue to be inadequately funded.

In 1970, the Office of Civil Rights of the Department of Health, Education, and Welfare ruled that school districts serving children with limited English proficiency were required to provide special programming that would allow them to participate effectively in the educational programs of the district.[73] These requirements were seldom enforced. Four years later, in *Lau vs. Nichols*, the United States Supreme Court affirmed this same obligation, requiring school districts to provide some form of special programming responsive to the needs of children with limited English proficiency.[74] In the same year, the Congress passed legislation consistent with the *Lau* decision, and a year later H.E.W.'s Office of Civil Rights issued *Lau* guidelines, describing how school districts were to comply with the Supreme Court decision and with federal law. The federal government, however, has never aggressively enforced these guidelines or the subsequent agreements in which school districts consented to provide bilingual education. The outcome is that most school districts provide minimal bilingual services, and students consequently have little access to programs which respond to their linguistic and cultural backgrounds.[75]

Throughout our hearings, the witnesses who spoke about this issue agreed on the fundamental need for all children to become proficient in the English language. Controversy does exist over the best way to accomplish this goal. However, the unspoken challenge underlying this controversy seems to be whether ours will be a society in which cultural differences are respected and opportunities are unlimited.

Sex Discrimination

"...I look back upon my high school days and I can truly say that I was cheated. I had no career counseling, wound up studying something I already knew how to do, and left school with few marketable job skills."[76]

Women face considerable educational and economic discrimination. By the time they reach young adulthood, females are often at a disadvantage relative to males in basic skills, in academic options and aspirations, in vocational and career opportunities and in anticipated economic security.

- Males and females achieve equally in most major subject areas at age nine; by age 13, females begin a decline and by 17 end up behind males in math, reading, science and social studies.[77]
- Vocational education programs remain overwhelmingly segregated by sex, with females clustered in those programs that prepare them for the lowest paying jobs. Females comprise 92

percent of those studying to be secretaries, or cosmetologists, but only five percent of those in electrical technology.[78]

- Women are less likely than men to complete four years of college; they are much less likely to continue through higher levels of education and obtain doctorates or professional degrees.[79]
- At all educational levels, women have higher unemployment rates than men.[80]
- Women college graduates on the average earn less than men with an eighth grade education. The average woman worker earns about 69 percent of what a man does, even when both work full-time; minority women earn less than any other group of worker.[81]
- Pregnancy is the major known cause of dropping out among school-age females. Three-fifths of women at or below the poverty level were high school drop-outs.[82]

The group of young women who continue to be the most discriminated against, both in educational and employment opportunities, are those who become parents before they are 18.

The group of young women who continue to be the most discriminated against, both in educational and employment opportunities, are those who become parents before they are 18. The director of a teenage pregnancy and parenting program in Seattle, Washington saw teenage pregnancy as the beginning of "a life pattern of lost educational opportunities, unstable family life, poor employability, and welfare dependency."[83]

Adolescents in the United States have among the highest pregnancy rates of any developed nation in the world.[84] The experts we spoke with offered a number of reasons for this, and some suggested school-related causes. One witness cited studies that have concluded that young people who are poor achievers in school and who have low educational aspirations are more likely to be sexually involved and therefore at risk of pregnancy. ". . . [I]f an adolescent girl feels that she is not going to be a high achiever and that there are no jobs or opportunities for her, she may decide that having a child at age 16 may not really disrupt her life."[85]

Many pregnant school-age women drop out of school. National statistics based on self-reporting indicate that 23.4% of the females who drop out of high school do so because of pregnancy.[86] Our witnesses testified to percentages as high as 50% or 60%. A number of witnesses noted how little is done in most schools to retain or bring back pregnant or parenting teens either in terms of providing support services or making the school climate more welcoming. As one presenter testified, "Even if she is granted medical maternity leave, she will probably fall behind in her studies. . . because home tutoring is not readily accessible and schools for pregnant girls do not have a full curriculum."[87]

Lack of day care also appears to be a principal reason teen parents have difficulty returning to school. With child care sporadic or uncertain, many of those who do return cannot meet the attendance requirements and end up suspended from school.[88] The director of a continuing education program for girls in Michigan noted that "teens returning to school after delivery fear being judged immoral, delinquent, or promiscuous by school personnel." Already frightened at the prospect of "being different" and of not fitting into a classroom situation, these young women "will very likely lose heart and stay at home."[89] As a social worker in Chicago put it, "when there are problems with re-registering and when administrative officials at the school are not supportive, it is hard to feel wanted."[90] She went on to describe what is likely to happen after the pregnant or parenting teen drops out:

> *Failing to return to school forces her into a cycle of pregnancy, poverty and dependency. Chances of a second pregnancy are very strong. Two babies make her a permanent statistic on the welfare rolls. Even if a job opened up she would not be skilled enough to take it or able to leave her babies. . . . Already poor achievers, many girls are not equipped to enter a jobs program because they cannot handle simple reading or math.*

In effect, our schools have all but written off this population of young women. Having allocated few resources designed to prevent pregnancy, schools offer little help once a student becomes a young parent. Inflexible institutional procedures, stigmatizing attitudes, and a lack of support services all represent barriers to thousands of young parents who might complete their education if the schools reached out to them.

For the majority of female students, differential and discriminatory treatment takes more subtle forms. In elementary and secondary schools, females often face low and stereotyped expectations on the part of teachers, administrators and counselors, and they are frequently confronted by biased texts and curriculum materials. Enrollment figures for females are not comparable to those of males in non-basic math and science courses or computer courses. Over two-thirds of the students taking computer courses are male; and most of the females who are enrolled are clustered in beginning classes.[4]

These patterns cannot be explained by gender differences in intelligence. Rather, they seem related to the absence of female role models in math and science within and outside of school and to expectations projected by the adults closest to them. Viewing most courses in math, science and computer science as unnecessary for traditional female career paths, teachers, counselors, and parents often discourage females from enrolling. Enrollment figures for girls in nontraditional vocational education courses and programs also continue to be extremely low. Particularly in low-income urban areas, the quality and kinds of training girls receive before entering the workforce operate on old, stereotypic assumptions about women's work.

Even more resistant to change than sex-stereotyped enrollment patterns are the daily, classroom interactions between teachers and students. Recent observations in elementary school classrooms indicate that boys receive more teacher attention than girls in every category of classroom interaction: active instruction, listening, praise, and punishment. Moreover, boys receive most of their negative feedback for nonacademic behavior and most of their positive feedback for academic performance, whereas girls are most likely to receive negative feedback for their academic work and positive feedback for nonacademic behavior.[89]

Young women attending vocational programs have experienced interactions that—at the extremes—can be most accurately labeled sexual harassment. A study conducted by the Full Access and Rights to Education (FARE) Coalition in New York quotes both vocational principals and teachers making derogatory comments about the young women in their schools. A female student noted that many girls respond to such official treatment, as well as to the attitudes of male students, by "skipping classes and eventually leaving school."[90]

Sex-related patterns in classroom interaction are further reinforced by sex-stereotyped presentation of females in many school texts. While we examined several studies which noted progress in the inclusion and presentation of females in school texts, these studies still concluded that texts continue to present many stereotyped images. Females, like minority groups, find neither their experiences nor their history or contributions adequately represented.[91]

Title IX...which specifically prohibits sex discrimination against pregnant teenagers, in schools and colleges receiving federal money, has not been adequately enforced.

Since 1981 the situation for females in the schools has worsened. Title IX of the Education Amendments of 1972, which specifically prohibits sex discrimination, including discrimination against pregnant teenagers, in schools and colleges receiving federal money, has not been adequately enforced. Federal funding for projects promoting educational equity for women provided through the Women's Educational Equity Act of 1974 has been reduced or diverted. With federal leadership in this area waning, most school systems have responded to fiscal and political pressures by taking care of "curriculum basics" and cutting back on all other priorities. In school systems across the country, sex equity coordinator positions have been eliminated and newly-developed women's studies materials and other non-biased curricula and syllabi have been left on the shelves. The statement made by a Massachusetts vocational school principal seems, unfortunately, to be prophetic: "All these initial energies have been spent cracking the wall. . . . If we stop now, the effect will be to seal up that initial crack and thus waste all of the initial effort."[92]

Special Education

"In November, 1975, when the Education for All Handicapped Children Act was enacted into law, we had finally reached the ultimate objective for education in a democracy: Zero reject. . ."[96]

Public schools now include over one half million more students with handicapping conditions than they did in 1976, the year Public Law 94-142 (The Education for All Handicapped Children Act) was implemented.[97] A major accomplishment of parent and citizen groups who struggled for many years to ensure educational services for handicapped students, PL 94-142, along with Section 503 of the Rehabilitation Act of 1973, requires that all children receive a free and appropriate public education. In spite of legislation requiring the education of children with special needs, serious problems continue to plague the special education system.

- Some children with special needs remain unserved. According to the Office of Civil Rights Elementary and Secondary School Surveys of 1980 and 1982, between 5.6 and 8.4 percent of students needing services were not receiving them.[98]
- Large numbers of poor and minority students are misclassified, excluded from the mainstream, and stigmatized by placement in classes for the mildly mentally retarded. In 1980-81, 3.35 percent of Black students and 1.06 percent of White students were assigned to such classes.[99]
- Special education programs and services sometimes fail to realize the goals of PL 94-142. For example, classes for the educable mentally retarded are often characterized by extremely low expectations and poor achievement outcomes.[100]
- Because of problems in service availability, many students are not served in the least restrictive settings.

Some service delivery problems reflect difficulties with the special education system itself; others, although appearing to be special education problems, represent shortcomings in the regular education system. Paradoxically, two of the most troubling sets of problems represent the reverse sides of the concern about access. Some schools, for example, fail to provide appropriate special education services for *all* those children who need them. At the same time, many school systems have placed large numbers of students who have learning difficulties but who are *not* handicapped in categorical programs for the mildly disabled. We heard testimony about both kinds of problems at our hearings.

When PL 94-142 was passed, Congress assigned high priorities to identifying and serving out-of-school handicapped children and youth and to meeting the needs of the severely handicapped. Our schools appear to have met these objectives fairly well in regard to those of elementary school age. However, large numbers of three to five year olds, secondary students, 18-21 year olds, and emotionally disturbed children of all ages, still remain underserved. Children of migrant families, military dependents, adjudicated and incarcerated youth, and foster children, many of them females, tend also to be underserved.[101]

Factors which determine whether a child has access to needed special services include the attitudes of regular education teachers, who typically initiate special education referrals, the state where the child lives, and the level of resources available in the school system which he or she attends. Uncertainty of federal funding also contributes to our schools' failure to meet the needs of all disabled students. The intent of Congress in 1975 was that the federal government would provide 40 percent of the additional cost of special education, thus alleviating the burden on states and localities. However, in reality, at best, the federal government has carried only 12 percent of the load; at worst, its support has amounted to only eight percent. States have been understandably slow to make up the difference.[102]

It seems unfair to this board, as it did to the parent of an autistic child who spoke to us in New York, that a parent who is already faced with ‘the tremendous challenges of parenting a child with handicapping conditions” also has to work constantly to ensure that the child receives needed services.[103] We repeatedly heard from parents who were in this situation.

In some school districts, children must wait lengthy periods for evaluations and for individual education plans. In many instances, children are not being served in the least restrictive environment required by law. Schools' failure to integrate disabled children into regular classrooms has special consequences for handicapped children and their parents residing in rural areas. These families may be forced to commute long distances or to settle for less than a full range of needed services.

In such cases, parents experience an understandable conflict between wanting their child to attend school close to home in a less restrictive setting and wanting their child to have access to all needed services which are often offered only in centralized and sometimes segregated facilities. Ironically, a child advocate from New York told us: "It is often the most severely handicapped children requiring the most specialized services who can least handle such a trip."[104]

...a lack of adequate regular education options designed to meet the needs of children with diverse learning styles results in misplacement of children in special education.

Another disquieting aspect of special education relates to future employment opportunities of handicapped students. "What happens," asked a Mississippi parent, "once they have been through the education system and are still not prepared for the normal world?"[105] Many parents who spoke to us echoed this worry about our schools' failure to prepare handicapped children for the world of work. Most noted with concern that the major developmental transitions of adolescence to adulthood and of school to work are hampered by the lack of a comprehensive, sequential vocational program for special education students.

Finally, despite legal mandates, some communities still fail to provide special education services to young people between the ages of 18 and 21, and many special education students do not receive regular high school diplomas. Thus, these students too may end their schooling with few, if any, options for future work.

On the other side of the coin, many children who are not handicapped end up in the special education system. Sometimes a lack of adequate regular education options designed to meet the needs of children with diverse learning styles results in misplacement of children in special education. Biased assessment and evaluation tools also support discriminatory referrals. Poorly defined criteria for entrance into categorical special programs, inferior curriculum, and failure to establish exit criteria which clarify what the child must accomplish to qualify for return to the regular classroom also contribute to inappropriate special education placements.[106]

The parent of a formerly misclassified child in Chicago presented us with this graphic description of her child's experiences:

> *He said, 'The kids call it a crazy class. . . a dummy class. He kept bringing the same books home year after year and he was falling further behind. I trusted them to put my child in a program that would increase his skills, but it never happened. . . . [H]e is a child with normal intelligence who has been reading at the fourth grade level for four years.*[107]

School children most likely to be misclassified are Black youngsters who perform adequately in a variety of roles in family and community, but experience difficulty in school. They often encounter the special education system after having experienced academic failure in the regular classroom. Adults in the school routinely locate the cause for such failure in the child, rather than in the classroom setting or the school environment.[108]

The child who has failed in the regular classroom is expected to benefit from smaller classes, a more leisurely instructional pace, increased individual attention, and appropriate services to promote learning. Many of these children, however, do not make educational progress in special classes for the special program may have little relationship to the real causes of the child's poor academic performance. Moreover, not surprisingly, inferior programming, lowered expectations for achievement, and damage to peer and school relationships often engendered by the assessment process and resulting label may present insurmountable barriers to improvement.[109]

Hispanic students tend to be under-represented in special education overall, although in some districts the pattern is similar to the national pattern noted for Blacks, with over-representation in some categories, and under-representation in others. The Director of Bilingual Special Education at the University of Texas provided us with a thorough description of special education service delivery for Chicanos in Texas:

> *Ninety-one percent of all Hispanics in special education in Texas are served in the categories of learning disabilities, speech handicaps and mental retardation. At the same time, Chicanos and Puerto Rican students are under-represented in all other categories of special education; that is, there are students who are in need of services who have not been identified. . . . seventy-one percent of the auditorially handicapped and 37 percent of the visually impaired are not receiving services.*[110]

In his testimony, this witness also outlined some specific mechanisms by which Chicano students are misclassified into special education and underserved in terms of their real education needs. These problems are likely to occur, he pointed out, "if children are tested in a language they do not understand, if achievement is measured in terms of a language they have not mastered, and if the group is not adequately represented in the population used to norm instruments."

Overplacement of children in classes for the learning disabled is an emerging, related national issue. The learning disabilities category grew 125 percent from 1976 to 1982.[111] Nationally, White children are over-represented in this category, while Black children are under-represented. Rapid growth of the learning disabilities category raises a number of questions, especially in view of recent research findings reported by the University of Minnesota Institute for Research on Learning Disabilities, which follow:

- Many non-handicapped students are being declared eligible for special education services.

- Educators and testers have no defensible system for declaring students eligible for LD services.
- No reliable psychometric differences exist between students labeled learning disabled and those simply considered low achievers.
- The most important decision made in the entire assessment process is the decision of the classroom teacher to refer a student for assessment. Once a student is referred, high probability exists that the student will be assessed and placed in special education.[112]

The process by which school districts are usually reimbursed under PL 94-142 requires them to find students handicapped and then determine their need for special services. Thus, the service delivery system which attaches labels to children in order to assure that money is spent on students of greatest need, also acts as an incentive to school districts to place more children in special classes, often inappropriately.[113]

Overplacement of children in classes for the learning disabled is an emerging national issue.

We believe that many of the misplacement issues which our witnesses identified are evidence of serious weaknesses within the regular education system. Ironically, the current educational reform movement with its emphasis on higher standards may increase the risk of low-achieving students being inappropriately labeled "handicapped." Unless higher academic standards in public classrooms are accompanied by additional resources directed toward strengthening the mainstream, an increasing number of children will be placed in "double jeopardy" by being assigned "handicapped" status in addition to their minority status. Our schools have too often used the hard-won and sorely needed system of special education as a resegregation mechanism to exclude poor and minority children from the regular classroom.[114] We should not allow this practice to continue.

II. SCHOOL EFFECTIVENESS AND QUALITY, TESTING, AND GENERAL ACHIEVEMENT

The Condition of Education 1984 Edition

National Center for Education Statistics

"The purpose of the Center shall be to collect and disseminate statistics and other data related to education in the United States and in other nations. The Center shall . . . collect, collate, and from time to time, report full and complete statistics on the conditions of education in the United States; conduct and publish reports on specialized analyses of the meaning and significance of such statistics; . . . and review and report on education activities in foreign countries."—Section 406 (b) of the General Education Provisions Act, as amended (20 U.S.C. 1211e-1).

Statistical Report
National Center for Education Statistics

Edited by Valena White Plisko

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U.S. Department of Education
T.H. Bell, Secretary

Office of Educational Research and Improvement
Donald J. Senese, Assistant Secretary

National Center for Education Statistics
Marie D. Eldridge, Administrator

Chapter 1
Elementary/Secondary Education

This chapter profiles national trends and developments in elementary/secondary education from the 1970's to the present and, where projections are available, into the next decade. The basic components of elementary/secondary education—students, resources, and performance—are each described in turn. Data over time are also presented by State to show the differential impact of change on enrollments, teachers, and finances. Trends in performance are broadly described in terms of high school graduation ratios and recent assessments of mathematics and science. Later chapters present more detailed information on high school completion and coursework.

Enrollment

Trends in Enrollment

Elementary/secondary education, having experienced enrollment growth in the 1950's and 1960's, met with unprecedented enrollment declines in the 1970's. From 1971 to 1982, total enrollment decreased steadily, reflecting the decline in the school-age population over that period. Enrollment is expected to continue falling until 1985, reaching 44.0 million (entry 1.1). Total enrollment is then expected to reverse its downward trend and increase slowly as the school-age population begins to grow. Total enrollment is projected to rise to 46.4 million by 1992, an increase of 1.6 million (4 percent) over 1982.

By grade level, enrollment trends are expected to contrast sharply as enrollments begin to increase in the lower grades and continue falling in the upper grades. Smaller birth cohorts entered the schools in the later half of the 1960's and reached the upper grades by 1977. Between 1970 and 1982, preprimary to 8th grade enrollment decreased from 36.6 million to 30.8 million, a 16 percent drop.

Enrollment in the lower grades (preprimary to 8th) is projected to decrease to 30.2 million in 1985 and then begin increasing in 1986. It is expected to reach 34.1 million by 1992, an increase of 11 percent from 1982. These gradual increases are projected as a result of slight rises in the number of annual births in recent years.

In the upper grades, a different pattern emerges. Between 1970 and 1982, 9th to 12th grade enrollment decreased from 14.6 million to 13.9 million, a drop of 5 percent. Over the 1980's and into the beginning of the next decade, 9th to 12th grade enrollment is projected to continue falling, reaching 12.3 million by 1992, a 12 percent decrease from 1982.

Both public and private schools registered enrollment declines between 1970 and 1982, but of different magnitude. In that period, public school enrollment fell 14 percent and is projected to decline even further to 39.0 million in 1985. It should then begin a slow rise to 41.1 million by 1992, a 4 percent increase over 1982. These trends—the drop between 1970 and 1982 and the gradual rise later—mirror those mentioned earlier for total enrollment. This is because public schools account for approximately 90 percent of total enrollment and so dominate the overall trend.

Private schools also recorded enrollment declines through the 1970's. Large decreases in Catholic school enrollment were offset considerably by rises in other private schools, resulting in a total decline of only 5 percent, from 5.4 million in 1970 to 5.1 million in 1982. By 1992, private school enrollment is projected to increase slightly to 5.3 million. At this time, private school enrollment is projected to account for 11 percent of the total enrollment in elementary/secondary schools, a proportion unchanged from 1982 and slightly up from 10.5 percent in 1970. These projections are based on past trends and school-age population projections and do not take into account the effects that policy decisions and individual choice may have on enrollments.

Change in Public School Enrollment, by State

In all, public school systems in 41 States and the District of Columbia experienced enrollment declines between Fall 1970 and Fall 1982 (entry 1.2). The States in the Northeast recorded the largest drops. Delaware, Connecticut, Rhode Island, South Dakota, and the District of Columbia experienced declines in public school enrollment of more than 25 percent. Of the nine States that registered enrollment increases, six showed gains greater than 10 percent: Wyoming (23 percent), Utah (22 percent), Nevada (18 percent), Arizona (16 percent), Idaho (12 percent) and Alaska (11 percent).

Nationally, public preprimary to 8th grade enrollment declined by 17 percent while 9th to 12th grade enrollment decreased by 6 percent. In most States, the direction of change was the same in the lower and the upper grades; that is, declines at the elementary level were typically followed by declines at the secondary level. However, there were exceptions. Secondary enrollment increases were substantial in Alaska (37 percent) and Nevada (34 percent), while elementary enrollment changes were comparatively small (3 and 4 percent increases, respectively). Colorado, Georgia, Hawaii, Michigan, and South Carolina declined in total enrollment but the decline was confined to the lower grades. Idaho and Wyoming experienced a net increase in total enrollment, but this increase was limited to the lower level. Conversely, New Hampshire's total enrollment increased slightly, even though enrollment declined in the lower grades.

Change in Minority Composition of Public School Enrollment

In 1980, racial/ethnic minorities comprised 27 percent of the total enrollment in public elementary/secondary schools (entry 1.3). This proportion was 6 percentage points higher than the level of minority enrollment in 1970. The minority share of public enrollment varied considerably from State to State. Three States and the District of Columbia had greater than 50 percent minority enrollment: the District of Columbia (96 percent), Hawaii (75 percent), New Mexico (57 percent), and Mississippi (52 percent). Minority students comprised less than 5 percent of the total enrollment in some New England and West North Central States, and in West Virginia.

Comparing 1980 with 1970 data shows that the percent of minority enrollment has risen in most States. California experienced the greatest percentage point increase (16 percent). Eleven other States, across all regions, increased in minority representation more than the national average of 6 percentage points. Decreases of less than 2 percentage points occurred in four Southern States, Missouri, and Wyoming.

Racial/ethnic minorities were distributed along discernible regional lines. Black students, for example, accounted for 16 percent of total public school enrollment nationally but made up much larger proportions of the total public school enrollment in the District of Columbia (93 percent) and five Southern States: Mississippi (51 percent), South Carolina (43 percent), Louisiana (42 percent), Georgia (34 percent), and Alabama (33 percent). A similar pattern held for other minorities. Hispanic students, while representing 8 percent of total enrollment nationally, accounted for much larger proportions of total enrollment in a number of Western and Southwestern States: New Mexico (46 percent), Texas (30 percent), California (25 percent), Arizona (24 percent), and Colorado (15 percent). The only other State with more than 10 percent Hispanic enrollment was New York with 12 percent. Less than 2 percent of public school enrollment was represented by Asians or Pacific Islanders. Many of these students were concentrated in Hawaii, where they made up 71 percent of Hawaii's student enrollment, and in California (7 percent). American Indians/Alaskan Natives made up less than 1 percent of the Nation's enrollment but had a large concentration in Alaska where they comprised 21 percent of total enrollment.

Language-Minority Composition of School-Age Population

A clear regional picture also emerges of the school-age population that speaks a language other than English at home. Approximately 10 percent of the 5- to 17-year-old population was counted in the 1980 Census as speaking a non-English language at home (entry 1.4). This proportion ranged from less than 5 percent in a majority of States to sizable shares of the population in some. States with relatively small minority-language populations were located in the north central and southern inland regions. States with 15 percent or more minority-language children were generally located along the Mexican border but also included New York. New Mexico had the highest percentage of children with non-English language backgrounds; more than one-third of its school-age residents were from homes in which a language other than English was spoken. California, New York, and Texas accounted for more than half of all the minority-language children. In comparison, these three States represented about one-fourth of the 5- to 17-year-old population.

Data from the 1982 Survey of English Language Proficiency add some detail and depth to this picture of language-minority children. These preliminary data indicate that the number of 5- to 14-year-olds who speak a language other than English at home has grown appreciably since 1976, while the number of other children in this age group has declined (entry 1.5). Between 1976 and 1982, language-minority children increased in number by some 27 percent, at the same time that the number of other children declined by about 13 percent. In 1982, approximately 4.6 million children were estimated to belong to households in which a language other than English was spoken, an increase of nearly 1 million from 1976. These minority-language children comprised an estimated 13 percent of the population 5 to 14 years old.

A special test of English proficiency administered with the survey has yielded preliminary results. They suggest the level of difficulty that minority-language children may have with English and other school work. About 59 percent of minority-language children in 1982 scored below the cut-off levels set for English proficiency. In comparison, approximately 42 percent of all other 5- to 14-year-olds fell below the cut-off scores. The same test administered in 1978 showed 63 percent of minority-language children scoring below the cut-offs. These data suggest that the proportion of minority-language children with limited-English proficiency appears to have decreased slightly between the two test years. Yet, the absolute numbers of minority-language children and those with limited English proficiency appear to have increased.

Trends in Special Education Participation

A major source of data on changes in participation in special education is the annual report prepared by each State education agency for the U.S. Office of Special Education and Rehabilitative Services. As of the 1982-83 school year, nearly 4.3 million persons 3 to 21 years old were reported to be receiving special education (entry 1.6). Between 1976-77, when the State counts were initiated, and 1982-83, the national total of handicapped children served annually increased by over half a million children, or 15 percent. Over the same time span, the total number of children enrolled in public elementary/secondary schools declined by about 10 percent (see entry 1.1). Thus, the proportion of children receiving special education, considered as a percentage of total public school enrollment, increased from about 8 percent in the 1976-77 school year to nearly 11 percent in 1982-83. Although the increases have continued into the early 1980's, the rate of increase from year to year has been slowing.

When the annual counts of persons in special education programs are broken down by type of handicapping condition, a more complex pattern of change emerges. The number of children receiving special instruction for specific learning disabilities rose sharply between 1976-77 and 1982-83, by some 119 percent. While the rate of increase from year to year in the numbers served slowed during the early 1980's, 7 percent more students received such services in 1982-83 than in 1981-82. The number of children receiving special instruction for the "seriously emotionally disturbed" also showed considerable growth over time, although not nearly as substantial as that for specific learning disabilities.

In contrast, the total number of students served for most other conditions generally declined from year to year between 1976-77 and 1982-83. The numbers of students receiving services for the speech impaired, hearing impaired, retarded, orthopedically handicapped, and visually handicapped all declined during this period.

These varying trends have had a noticeable impact on the composition of the special education population. The two largest categories of special education students in 1976-77 were the speech impaired, who made up 35 percent of all special education students, and the mentally retarded, who comprised 26 percent of the total. By

1982-83, these two groups had been displaced by the learning disabled category, which had grown from less than 22 percent of the special education population in 1976-77 to nearly 41 percent, while the speech impaired and mentally retarded had fallen to 27 percent and 18 percent respectively.

Trends in Preprimary Enrollment

Another area that experienced considerable growth during the 1970's was preprimary education. Over the past decade, enrollments in nursery schools and kindergartens increased significantly. From 1970 to 1982, public and private preprimary enrollment increased from 4.3 million to 5.5 million, an increase of 27 percent (entry 1.7). This increase occurred despite the 8 percent decline in the 3- to 5-year-old population over this period. As the preprimary-age population increases over the projection period, preprimary enrollment is anticipated to increase to 7.0 million by 1992, an increase of 28 percent from 1982.

Preprimary enrollment increased from 1970 to 1982 in both public and private nursery schools and kindergartens. Public enrollment increased from 3.0 million in 1970 to 3.5 million in 1982, a rise of 17 percent. By 1992, this number is expected to reach 4.3 million, an increase of 25 percent. Private enrollment climbed considerably more, from 1.3 million in 1970 to 2.0 million in 1982, an increase of 52 percent. By 1992, private preprimary enrollment is projected to reach 2.6 million, an increase of 34 percent. For both public and private schools, the major increases are projected for 3- and 4-year-olds, since enrollment of 5-year-olds is already approaching 100 percent.

The employment of mothers with preschoolers has contributed to these trends and will continue to affect enrollment in the future. In addition, a growing recognition of the importance of early education may also be contributing to the increased numbers, as well as the availability of nursery and kindergarten classes. The increase in children of preprimary age, which began in 1980, is expected to boost these numbers still further.

Public Preprimary Enrollment Compared With First Grade Enrollment, by State

One way to measure the recent growth in public preprimary enrollment is to compare it with 1st grade enrollment (entry 1.8). In the fall of 1982, virtually as many children were being educated in public preprimary programs as were enrolled in 1st grade (97 percent). This recent high level of preprimary enrollment may be contrasted with the level it reached in 1970 when it represented about two-thirds of 1st grade enrollment.

Preprimary enrollment as a percent of 1st grade enrollment rose in almost all States during this period. Four Southern States (West Virginia, North Carolina, Kentucky, and Tennessee), along with New Mexico and North Dakota, showed an increase of more than 75 percentage points. Thirteen Southern States, five Western States, North Dakota, and Vermont had substantial increases in preprimary enrollment despite their declining 1st grade enrollments.

Resources

Schools

Change in Number of Public Schools

In 1980-81, public elementary/secondary schools numbered 85,900, representing a 5 percent decline from 1970-71 (entry 1.9). This decrease resulted from continued consolidation, school closings, and fewer school openings as enrollments declined.

Despite the contraction in the number of schools, the organizational diversity that existed in 1970-71 was maintained. Both the 1970-71 and 1980-81 surveys show almost every possible combination of grades in public schools. Undoubtedly, some of these atypical grade spans may have resulted from misclassification of schools. Even so, considerable variety is evident in the data. At each level—elementary, junior high/middle, and secondary—the most typical grade span represented less than half the schools and enrollments.

The drop in the number of elementary schools was more than twice the percentage decrease for all public schools. In schools organized from preprimary (or 1st) to 6th grade, the most typical elementary grade span, the decrease was even larger, 13 percent. Schools with grade spans of preprimary (or 1st) to 7th and preprimary (or 1st) to 8th also showed relatively large declines. These declines coincide with the combining of the 6th grade with the 7th and 8th grades in many school systems and the growth of the middle school. Also, preprimary or 1st-grade-only schools grew in number, along with the category of schools with miscellaneous grade spans. Overall, fewer elementary schools comprised the public school systems in 1980-81 than in the prior decade, and the average enrollment size declined as well.

At the junior high or middle school level, the overall increase in number of schools may be primarily attributed to the growth of schools with middle level grade spans: 5th to 8th, 6th to 8th, and 7th to 8th. The numbers with middle grade spans may have grown for both pedagogic and pragmatic reasons. In the 1960's, many educators, supported by research on the preadolescent, began to promote a distinctive instructional program for this age group. This educational basis for middle schools was further bolstered by the pragmatic need to establish new schools to relieve overcrowding as numbers in this age group swelled in the late 1960's. In the later 1970's, as enrollments declined, the middle school grade spans were used to consolidate grades into adequately sized units. Many school districts moved the 9th grade out of their junior high schools to maintain enrollments at the secondary level. While the junior high with a 7th to 9th grade span was still the most prevalent at the intermediate level, this category declined by 29 percent between 1970-71 and 1980-81. The average enrollment size for all categories of junior high or middle schools was smaller in 1980-81 than in the previous decade. Schools organized from 7th to 9th grade had an average enrollment size larger than schools with other grade spans at this level.

The number of secondary schools increased by 5 percent from 1970-71 to 1980-81. Schools with 9th to 12th grade spans, the most prevalent type, grew in number, while secondary schools with 7th to 12th grade spans and 10th to 12th grade spans declined. The average enrollment size increased slightly and was larger in schools with more limited grade spans.

Combined elementary/secondary schools, which comprised less than 2 percent of all schools, increased during the period by one-fifth. However, these schools served fewer children and had a smaller average enrollment size in 1980-81 than in 1970-71. Schools with unclassified lowest and highest grades numbered some 2,200 in both years. A majority of these schools were operated for special education students.

Teachers

Trends in Number of Teachers

In the 1970's, initial enrollment declines were not followed immediately by declines in the number of teachers employed. Not until the late 1970's did the number of classroom teachers begin to decline in the public schools and level off somewhat in the private schools (entry 1.10). In the public schools, increased staffing needs in special and bilingual education programs partially offset the reduced demand for teachers. Between 1970 and 1977, the number of classroom teachers in the public schools increased by 7 percent while enrollment declined by 5 percent. In the private schools, where enrollment decline wavered and staffing ratios improved steadily, the number of classroom teachers increased by about one-fifth over the period.

In the late 1970's, severe budgetary constraints in the public schools slowed further improvement in teacher-pupil ratios and the expansion of student services. Consequently, the number of public school teachers began to decline after 1977, decreasing from 2.21 million in that year to 2.11 million in 1982. The number of private school teachers remained relatively constant over the period. The total number of teachers, public and private combined, declined from 2.49 million in 1977 to 2.40 million in 1982.

When elementary school enrollments begin climbing again in both sectors in the latter half of the 1980's, the number of classroom teachers is projected to increase again, reaching an all-time high of 2.62 million in 1992. The growth projected at the elementary school level may mean that nearly 19 percent more elementary school classroom teachers will be working in 1992 than in 1982. Since enrollment increases will not reach the secondary level until after 1990, the number of secondary school classroom teachers is expected to continue declining through 1990. In the 1990's, growth in the number of teachers in secondary schools is expected to parallel the rise in the number of teachers in elementary schools in the mid-1980's.

Trends in Teacher-Pupil Ratios

These staffing trends are reflected in teacher-pupil ratios, which grew rapidly in the early 1970's and more slowly in the later period. The ratios also show differences over time between public and private schools. At the start of the 1970's, teacher-pupil ratios (i.e., the number of teachers per 1,000 students) were somewhat higher in public elementary schools than in private elementary schools (entry 1.11). However, this pattern was reversed by the second half of the decade when the ratios in elementary schools rose more rapidly in the private sector. Enrollment in Catholic schools, with traditionally lower teacher-pupil ratios, declined relative to enrollment in other private schools and this decline had the effect of raising total staffing levels in the private sector. In addition, Catholic schools during this period increased teacher-pupil ratios to levels comparable with those of public schools.

In the same period, public secondary schools maintained lower teacher-pupil ratios than private schools; that is, fewer teachers were assigned to students in public secondary schools than in private secondary schools. In the projected period, teacher-pupil ratios are expected to rise more slowly at both levels and in both sectors.

Trends in Teacher Demand and Supply

The total annual demand for additional teachers includes those needed to respond to changes in enrollment and to changes in teacher-student ratios and to replace teachers leaving the profession (teacher turnover). The cumulative demand for additional teachers fell from 875,000 in the 5-year period 1973 to 1977 to 647,000 in the 1978 to 1982 period (entry 1.12). During the current 5-year period (1983 to 1987), when enrollment is expected to bottom out, the demand for additional teachers is expected to increase slightly to 777,000. In the late 1980's and early 1990's, enrollment is projected to increase steadily. Therefore, the demand for additional teachers between 1988 and 1992 is expected to jump to 924,000. This represents a projected increase from an average 129,000 additional teachers needed each year between 1978 and 1982 to an average 185,000 in the 1988 to 1992 period. These demand projections are based on the assumptions that total enrollment will rise, teacher-pupil ratios will improve only slightly, and the turnover of teachers will remain constant at an estimated 6 percent. If these conditions are altered, the projections may also change.

Between 1973 and 1977, almost half (43 percent) of the demand for additional teachers came from secondary schools as enrollments declined at the elementary level but continued to rise at the secondary level. When enrollments began falling in secondary schools in the latter half of the 1970's, the demand for additional teachers in the schools also began a sharp decline. The drop was more pronounced than the earlier decline in demand for elementary school teachers. This suggests that the demand for additional teachers at the secondary school level is more responsive to enrollment declines than at the elementary school level. As a result, the secondary school proportion of the total demand for additional teachers dropped to less than 40 percent between 1978 and 1982 and is projected to remain at that level in the 1983 to 1987 period. Between 1988 and 1992, as enrollments in secondary school bottom out, only 31 percent of the total demand for additional teachers is projected to be in secondary schools.

Projecting the supply of additional teachers is even less certain than estimating demand. The supply consists of new teacher graduates and a reserve pool of former teacher graduates and former teachers. From 1970 to 1982, the annual supply of newly qualified teacher graduates decreased from 284,000 to an estimated 143,000. As a percent of bachelor's degree recipients, new teacher graduates dropped from 34 percent to 15 percent over the period. Should the smaller percentage remain fairly stable over the next 10 years, the supply of new teacher graduates will also remain fairly stable at about 140,000 per year. At this level, the supply of new teacher graduates could equal about 93 percent of the projected demand for additional teachers between 1983 and 1987. However, in the following 5-year period, the supply of new teacher graduates would only equal about 75 percent of the demand for additional teachers. Large numbers of teachers would, therefore, have to be hired from the reserve pool.

If college students respond to the projected shortage of new teacher graduates in the late 1980's and early 1990's by increasing their enrollment in teacher preparation programs, then the projected shortage may not occur. A gradual increase from the current 15 percent of bachelor's degree recipients in 1982 to about 21 percent in 1992 would probably be sufficient to offset an overall shortage.

However, should increasing numbers of college students continue to choose careers in other fields because of perceived better salaries and working conditions, then the shortage of new teacher graduates could become quite severe. Should the percentage of bachelor's degrees in teacher preparatory programs fall gradually to about 11 percent in 1992, then the supply of new teacher graduates could equal less than 60 percent of the projected demand for additional teachers between 1988 and 1992.

These teacher supply and demand projections deal only with aggregate figures for the entire Nation and for all teaching fields. Even during periods of general nationwide surpluses, teacher shortages may occur in some geographic locations and in some subject fields. A similar situation may exist during periods of overall shortages, when teachers in some locations or teaching fields may be unable to find teaching openings.

Change in Number of Public School Teachers, by State

After reaching an all-time high in 1977, the number of public elementary/secondary school teachers began declining but was still 3 percent larger in 1981 than in 1970. Although the number of teachers appears to be relatively stable nationally between the earlier and later years, the percent changes among the States varied considerably (entry 1.13). Decreases in the number of classroom teachers occurred in 16 States and the District of Columbia. With the exception of California and Hawaii, these States were located in the Northeast and North Central regions. Generally, these States also experienced relatively large enrollment declines (see entry 1.2). Twice as many States increased their number of teachers as those that decreased. The 13 States in which the number of teachers increased 20 percent or more included Western and Southern States and New Hampshire. With the exception of Utah, all States with enrollment increases also had increases in the number of teachers of 20 percent or more.

Finance

Change in Expenditures per Pupil, by State

Current expenditures per pupil averaged $2,724 in 1981-82, while a decade earlier they had amounted to $911 (entry 1.14). When adjusted for inflation, the increase was 34 percent. States did not share equally in this growth: while expenditures in some States grew at rates almost double the national average, expenditure growth in a few clearly lagged. As will be shown, educational expenditures are tied to the cost-of-living in States, and above-average increases often reflect growing economies. States with the highest expenditure growth rates included Alaska, Colorado, Massachusetts, Montana, Oklahoma, and Wyoming. The result was to push expenditures in all these States (except Oklahoma) to levels that were well above average. In Oklahoma, expenditures per pupil grew from a low of 75 percent of the U.S. average in 1970-71 to almost the average level in 1981-82. States with the lowest growth rates were Georgia and New York, though the impact on expenditure levels was markedly different in these two States. Expenditures in Georgia lagged further behind the national average, while in New York per pupil expenditures remained above average, though slipping from 72 percent above the mean in 1970-71 to 57 percent above a decade later.

The number of States spending well above the national average has grown in recent years, while the number of low-spending States has remained unchanged. In 1970-71, 17 States had per pupil expenditures 15 percent or more below the national mean, while 5 States exceeded the average by 15 percent or more. In 1981-82, 14 States were spending 15 percent or more below average, but those spending more than 15 percent above the national average had grown to 11. At the same time, the range in expenditures appears to have shrunk. In 1970-71, expenditures per pupil ranged from a low of $600 to a high of $1,567, or from 66 percent to 172 percent of the national average. A decade later, this range extended from a low of 68 percent to a high of 157 percent of the national average, excluding Alaska, where real expenditures had almost doubled.

Expenditures per Pupil and State Fiscal and Demographic Features

Declining enrollments, as well as increases in real revenue, accounted for the growth in per pupil expenditures. Nationally, declining enrollments that were characteristic of the decade contributed to rising per pupil expenditures, since available revenues were spread among a shrinking student body. Average daily membership in public schools declined from approximately 46 million in the early 1970's to under 40 million by the 1980's, or about 14 percent. In this same time span, real revenues for public schools increased by 5 percent, also contributing to rising per pupil expenditures.

Fiscal and demographic features of States were examined in an attempt to identify patterns that influence school spending and may account for some of the differences in school expenditures among States.* To a large extent, differences in per pupil expenditures among States reflect wealth (and price) differences as measured by per capita incomes. In 1971-72, 20 States had per capita incomes 10 percent or more below the national average (entry 1.15). Of these States, 16 had per pupil expenditures that were also 10 percent or more below the national mean. A decade later, of 16 States with per capita incomes 10 percent or more below the national average, 14 had per pupil expenditures below the mean by 10 percent or more.

School tax efforts are based on State/local revenues for schools as a proportion of income in each State (effort = revenues/income). This measure of effort declined nationally from 5.1 percent to 4.4 percent between 1971-72 and 1981-82. This decrease reflected enrollment declines that led States to allocate less of their resources for elementary/secondary education. In addition, a 6-percent rise in per capita income that occurred during this period meant that equivalent school revenues could be raised with lower tax efforts. However, not all States were able to reduce tax efforts, notably in the South where tax efforts rose in a number of States. As a result, most Southern States had school tax efforts closer to the national average in 1981-82 than they had a decade earlier. States with the highest school tax efforts in 1981-82 were Alaska, Michigan, Montana, New Mexico, Oregon, Utah, and West Virginia.

To present the association of these variables with expenditures, it is useful to partition the States into those with higher- and lower-than-average expenditure growth rates. Nearly half the States (22) exhibited growth rates in per pupil expenditures that were 5 percent or more above the U.S. average growth between 1971-72 and 1981-82. These States were also characterized by per capita incomes that were rising at rates equal to or faster than the national average. Most had school tax efforts in 1981-82 that were higher relative to the national average than a decade earlier. These States also allocated a larger share of State/local expenditures for public schools in 1981-82. In the majority of these States, public school students comprised a smaller share of each State's resident population in 1981-82 than in 1971-72.

At the other extreme, eight States experienced relative declines in per pupil expenditures of 5 percentage points or more between 1971-72 and 1981-82. Most of these also exhibited stable or declining incomes compared to the U.S. average, i.e., income growth rates of 6 percent or less. Most of these States also had public school students that comprised a larger share of the resident population in 1981-82. The growth in the ratio of students to population would inevitably depress per pupil expenditures, barring increases in revenues. Utah presents an extreme case of this phenomenon where, despite a substantial increase in tax efforts, the growing proportion of public school students caused per pupil expenditures to lag. On other variables, no clear pattern emerges among States where expenditures grew at below-average rates.

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* These data had originally been compiled by the School Finance Project using published National Education Association estimates. For a description of the analysis, see Data Sources in the Appendix.

Changes in School Revenues, by Source

During the 1970's, State revenues rose to become the principal source of funds for public schools. In 1971-72, States provided, on the average, 38 percent of public school revenues (entry 1.16). A decade later, this share was equal to 47 percent. Federal revenues had increased from under 8 percent of the total in 1971-72 to 9 percent in 1979-80, but then slipped to 7 percent in 1981-82. The growing dependence on State revenues has pronounced significance for school funding. The principal sources of State revenues are sales and income taxes, the proceeds of which can vary substantially with the business cycle. These variations inevitably influence the amount of State aid provided annually to local school districts. In addition, State education aid is often tied to student counts, so that declining enrollment causes States to reduce school funds to their school districts. On the other hand, local revenues are largely derived from property taxes, which tend to be a more stable source of revenues, much less subject to cyclical variations or enrollment changes. The greater reliance on State revenues can, however, reduce intrastate differences in per pupil expenditures that are often related to the wealth of local school districts.

The largest shift in funding sources occurred in California where State funds replaced most local revenues following the adoption of Proposition 13, a referendum measure which substantially reduced local property tax revenues in that State. In Washington, the local property tax was converted to a State-wide tax that accounts, in part, for the rapid rise in the State share there. In many States, the passage of school finance reform laws during the 1970's was accompanied by increased financial participation by the States. Expenditures did not always rise as a result, and in three States, despite increased State shares of 15 percentage points or more, declines in per pupil expenditures relative to the U.S. average occurred, specifically in Indiana, Nevada, and Arizona.

Change in Federal Education Aid

Federal education aid per pupil rose from about $112 in 1971-72 to $234 a decade later, but in real dollars this aid was virtually unchanged (entry 1.17). Though Federal aid is not distributed on a per pupil basis, the use of per pupil amounts highlights changes that have occurred in the distribution of Federal aid among the States since 1971-72. In that year, Federal education aid per pupil ranged in the States from a low of 27 percent of the U.S. average to a high of 269 percent. Most States received Federal funds that, when expressed in per pupil amounts, were well below average, while only 12 States received Federal funds equal to or greater than 90 percent of the U.S. average. A decade later, the range in Federal aid amounts distributed among the States had been reduced, varying from 63 percent to 184 percent of the U.S. average per pupil amount (235 percent for the District of Columbia). Equally important, Federal aid was more evenly distributed among the States, with 20 States receiving the equivalent to a per pupil amount 10 percent or more below average and 18 States and the District of Columbia receiving aid equal to or above 110 percent of the U.S. average.

A number of States exhibited substantial growths of 50 percentage points or more in Federal aid relative to the U.S. average during this period, including California, Delaware, Illinois, Michigan, North Carolina, Oregon, and Pennsylvania. Compared to the U.S. average, Federal aid per pupil declined in only a handful of States, most notably in Alaska, Idaho, Kentucky, and New York.

This new aid distribution is due, in part, to changes in the relative importance of the various Federal programs that reach elementary/secondary school students. In 1971-72, this aid was composed largely of programs for the disadvantaged and impact aid, school assistance for federally affected areas. A decade later, aid distributed for handicapped children had grown dramatically, while impact aid had become relatively less important. The relative size in aid for disadvantaged students was unchanged. Differences in how aid is calculated under these various programs account in part for changes in the distribution of Federal aid among the States.

Trends in Total Expenditures, by Purpose

Significant changes in reporting expenditure categories after 1979-80 do not allow for detailed comparisons between data for the early 1980's and the previous decade. Detailed comparisons can be drawn instead between 1970-71 and 1979-80 and will be discussed first. From the beginning to end of the 1970's, total expenditures more than doubled, but in constant dollars this increase was no more than 4 percent (entry 1.18). Current expenditures, which made up 87 percent of the total in 1970-71, represented 91 percent by 1979-80. Yet outlays for instruction, the largest component, slipped during the decade as teacher salaries did not keep pace with inflation. At the same time, a pronounced growth in fixed charges occurred as teachers and other personnel received higher fringe benefits in the form of contributions to retirement funds and medical and life insurance premiums. Outlays for operating and maintaining buildings and buses also grew, largely reflecting higher fuel costs both for heating and transportation. Plant operation and maintenance comprised 10 percent of total outlays, and transportation another 4 percent in 1979-80. Administration costs remained about 4 percent. Capital outlays and interest on school debt became relatively less important as enrollment declines led to diminished school construction and debt for previously built schools was being paid off.

Trends in Salaries for Classroom Teachers

Average annual salaries of classroom teachers in public schools increased from $9,269 in 1970-71 to $19,157 in 1981-82 (entry 1.19). In real terms, teacher salaries were 13 percent lower in 1981-82 as inflation eroded their purchasing power. These salaries in 1981-82 were more than 14 percent lower than in their peak year in 1972-73. Real teacher salaries registered their first decline of the decade in 1973-74 as inflation started to climb. They declined even further in 1974-75 and then remained relatively stable through 1977-78. But in 1978-79, real salaries began a precipitous decline that continued over the next 2 years. The 1981-82 school year was the first time in 5 years that teacher salaries had not been further lowered by inflation. In that year, they showed a modest increase of $30 over 1980-81.

Performance

Change in Mathematics Performance

The National Assessment of Educational Progress (NAEP) provides periodic assessments of student performance in key subject areas. Changes in reading performance were documented in last year's edition of *The Condition of Education*. In 1978 and 1982 NAEP conducted mathematics assessments of 9-, 13-, and 17-year-old students (entry 1.20). Of the three age groups, only the 13-year-olds improved significantly in overall mathematics performance between 1978 and 1982. Significant gains for 13-year-olds were made across all racial/ethnic groups, achievement quartiles, community types, and in both heavily minority and predominantly white schools. Most noteworthy are the groups that showed improvements in performance greater than the 3.8 percent increase attained by 13-year-olds overall; these groups included blacks, Hispanics, low achievers, students in heavily minority schools, and urban community residents. For 9- and 17-year-olds, although the performance in mathematics was in general unchanged between 1978 and 1982, 17-year-olds in heavily minority schools improved significantly in the mathematics assessment.

Assessment items were divided into four successive levels of mathematics learning. From the simplest to the most complex levels, the test items measured: (1) knowledge of basic facts and definitions; (2) skills enabling one to use specific mathematical procedures; (3) understanding of facts or skills in order to transform knowledge; and (4) ability to apply one's knowledge, skills, and understanding to a problem-solving activity.

Consistent with the overall results in the mathematics assessment, 13-year-olds' performance improved significantly across all four levels between 1978 and 1982 (entry 1.21). Data for 13-year-olds, when broken out by race/ethnicity, achievement level, and community type, showed that most groups performed better in 1982 than in 1978 across the developmental levels. The general trend, however, was that the magnitude of improved performance was greater at the lower learning levels. One explanation of this result is that exercises most easily taught and learned by memorization form the basis for questions examining knowledge, skills, and understanding. By contrast, exercises measuring the ability to apply mathematical concepts to problem-solving activities call upon more complex thinking, not taught by rote drills. In all four levels, performance improvements among 13-year-olds were greater for minorities than whites, for low rather than high achievers, and for urban rather than rural community residents. Nine-year-old students who were black or low achievers and 17-year-old disadvantaged urban students also significantly improved their performances on knowledge exercises.

Change in Science Performance

Science performance was measured by NAEP in 1977 and by the Science Assessment and Research Project (SARP) in 1982. Knowledge measured in the scientific assessment was categorized in three areas—content, inquiry, and science, technology, and society. Science content items tested student understanding of the natural world encompassing biology, physical science, earth science and integrated topics. Nine-year-olds were not tested for science content. Inquiry items dealt with skills required to derive scientific knowledge, that is, the use of appropriate methodology and decision-making procedures. Finally, science, technology, and society items assessed students' understanding of the everyday uses of science.

Across all age groups and science areas, the only statistically significant gains reported were for 9-year-olds in the area of science, technology, and society (entry 1.22). Both males and females showed improvement; white males in particular registered significant gains.

Significant changes also occurred among the 17-year-olds whose performance declined in the content and inquiry assessment areas. Both males and females scored significantly lower in 1982 than in 1977, as did students in the Northeast. Performance on inquiry items also decreased for white and black students; however, only white student declines were statistically significant.

Between 1977 and 1982 13-year-olds showed no significant changes in science performance. Overall, science performance showed minimal changes or mixed results in all age groups. And only among the younger students did scientific knowledge, as it relates to themselves and the world, appear to be increasing.

High School Graduates

The number of high school students graduated each year remained relatively unchanged from 1970-71 to 1981-82, equalling 3.0 million in the later years (entry 1.23). During these years, the ratio of graduates to the 18-year-old population stayed below 72 percent. As the number in this age cohort declines, the number of graduates is projected to decline significantly from 1981-82 to 1992-93. With no noticeable change expected in the high school graduation rate, the number of high school graduates is projected to decrease to 2.4 million in 1992-93, a drop of 21 percent from 1981-82.

Trends in the number of high school graduates are expected to be similar in public and private schools. The number of public high school graduates increased from 2.6 million in 1970-71 to 2.7 million in 1981-82, an increase of 3 percent. This number is projected to drop to 2.1 million by 1992-93, a decline of 21 percent. The number of private high school graduates fell from 300,000 in 1970-71 to 290,000 in 1981-82, a decrease of 3 percent. This number is projected to decrease still further to 236,000 by 1992-93, a decrease of 19 percent.

Table 1.1

Trends in Elementary/Secondary School Enrollment, by Control of School and Grade Level: Fall 1970 to Fall 1992

(In Thousands)

Fall of Year	Total Enrollment			Public School Enrollment			Private School Enrollment		
	Preprimary to 12th Grade	Preprimary to 8th Grade	9th to 12th Grade	Preprimary to 12th Grade	Preprimary to 8th Grade	9th to 12th Grade	Preprimary to 12th Grade	Preprimary to 8th Grade	9th to 12th Grade
1970	51,272	36,629	14,643	45,909	32,577	13,332	5,363	4,052	1,311
1971	51,281	36,165	15,116	46,081	32,265	13,816	[1]5,200	3,900	1,300
1972	50,744	35,531	15,213	45,744	31,831	13,913	[1]5,000	3,700	1,300
1973	50,429	35,053	15,377	45,429	31,353	14,077	[1]5,000	3,700	1,300
1974	50,053	34,621	15,432	45,053	30,921	14,132	[1]5,000	3,700	1,300
1975	49,791	34,187	15,604	44,791	30,487	14,304	[1]5,000	3,700	1,300
1976	49,484	33,831	15,653	44,317	30,006	14,311	5,167	3,825	1,342
1977	48,716	33,133	15,583	43,577	29,336	14,240	5,140	3,797	1,343
1978	47,636	32,060	15,576	42,550	28,328	14,223	5,086	3,732	1,353
1979	46,645	31,631	15,014	41,645	27,931	13,714	[1]5,000	3,700	1,300
1980	45,949	31,297	14,652	40,987	27,674	13,313	4,962	3,623	1,339
1981	45,199	30,945	14,255	40,099	27,245	12,855	[1]5,100	3,700	1,400
1982	44,743	30,843	13,901	39,643	27,143	12,501	[1]5,100	3,700	1,400
				Projected[2]					
1983	44,231	30,610	13,621	39,131	26,910	12,221	5,100	3,700	1,400
1984	43,925	30,246	13,679	38,925	26,646	12,279	5,000	3,600	1,400
1985	43,977	30,236	13,741	38,977	26,636	12,341	5,000	3,600	1,400
1986	44,175	30,587	13,588	39,075	26,887	12,188	5,100	3,700	1,400
1987	44,173	30,993	13,180	39,173	27,293	11,880	5,000	3,700	1,300
1988	44,344	31,583	12,761	39,244	27,783	11,461	5,100	3,800	1,300
1989	44,644	32,209	12,435	39,444	28,309	11,135	5,200	3,900	1,300
1990	45,069	32,925	12,144	39,869	28,925	10,944	5,200	4,000	1,200
1991	45,641	33,457	12,184	40,441	29,457	10,984	5,200	4,000	1,200
1992	46,378	34,125	12,253	41,078	30,025	11,053	5,300	4,100	1,200

[1] Estimated

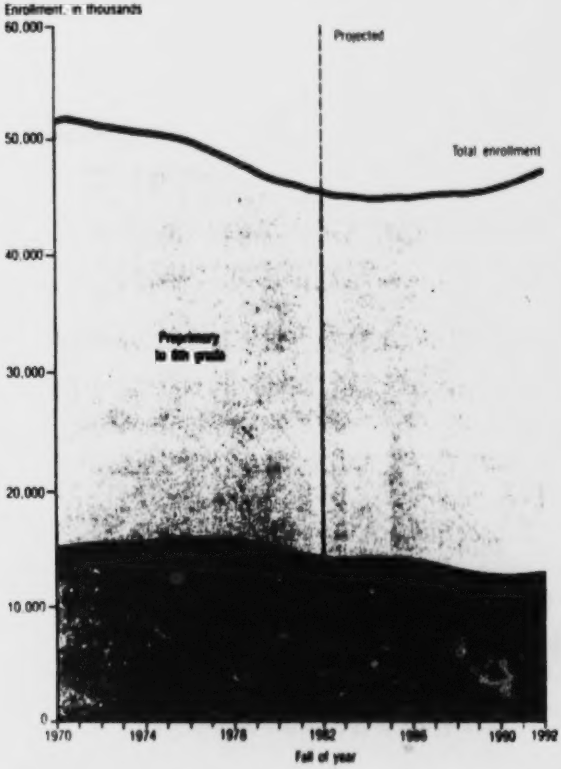
[2] For methodological details, see *Projections of Education Statistics to 1992-93*, forthcoming.

NOTE: Details may not add to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Statistics of Public Elementary and Secondary Day Schools*, various years; *Statistics of Nonpublic Elementary and Secondary Schools*, various years; and *Projections of Education Statistics to 1992-93*, forthcoming.

Chart 1.1

Enrollment in Regular Elementary/Secondary Day Schools, by Grade Level



Enrollment in the lower grades is projected to increase beginning in 1986, while in the upper grades it is expected to continue declining throughout the 1980's and into 1990.

Table 1.2

Public Elementary/Secondary School Enrollment, by Grade Level and State: Fall 1970 and Fall 1982

(Numbers in Thousands)

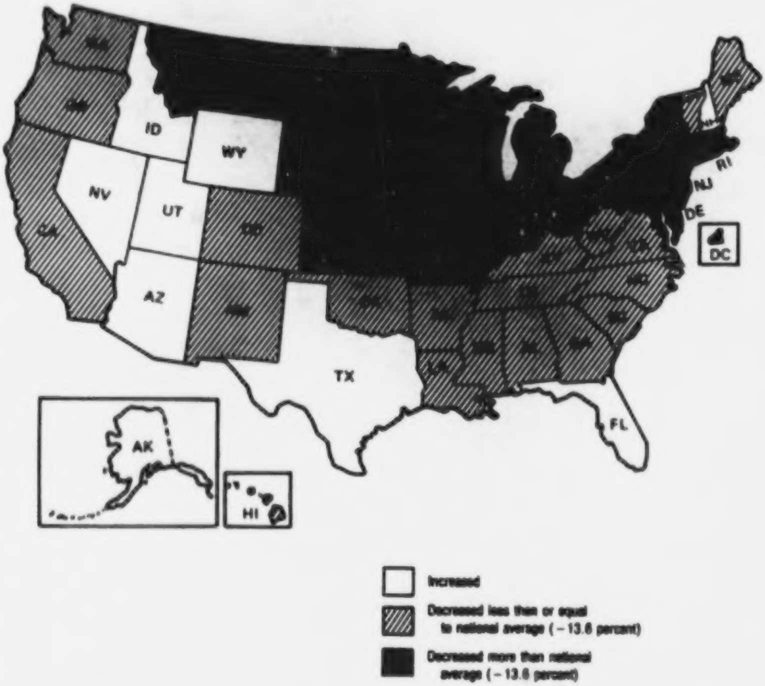
State	Total Enrollment			Preprimary to 8th Grade Enrollment			9th to 12th Grade Enrollment		
	Fall 1970	Fall 1982	Percent Change	Fall 1970	Fall 1982	Percent Change	Fall 1970	Fall 1982	Percent Change
United States	45,909	39,643	-13.6	32,577	27,143	-16.7	13,332	12,501	-6.2
Alabama	805	724	-10.1	570	510	-10.5	235	214	-8.9
Alaska	80	89	11.3	61	63	3.3	19	26	36.8
Arizona	440	510	15.9	314	359	14.3	126	151	19.8
Arkansas	463	433	-6.5	330	304	-7.9	133	128	-3.8
California	4,633	4,065	-12.3	3,231	2,802	-13.3	1,402	1,264	-9.8
Colorado	550	545	-0.9	391	380	-2.8	159	166	4.4
Connecticut	662	486	-26.6	487	336	-31.0	175	150	-14.3
Delaware	133	93	-30.1	94	60	-36.2	39	33	-15.4
District of Columbia	146	91	-37.7	113	65	-42.5	33	26	-21.2
Florida	1,428	1,485	4.0	1,016	1,039	2.3	412	446	8.3
Georgia	1,099	1,054	-4.1	800	739	-7.6	299	315	5.4
Hawaii	181	162	-10.5	129	110	-14.7	52	52	0
Idaho	182	203	11.5	124	145	16.9	58	58	0
Illinois	2,357	1,880	-20.2	1,688	1,287	-23.8	669	593	-11.4
Indiana	1,231	1,000	-18.8	876	664	-24.2	355	336	-5.4
Iowa	660	505	-23.5	465	338	-27.3	195	167	-14.4
Kansas	512	407	-20.5	357	283	-20.7	155	124	-20.0
Kentucky	717	651	-9.2	513	458	-10.7	204	194	-4.9
Louisiana	842	776	-7.8	615	556	-9.6	227	220	-3.1
Maine	245	212	-13.5	177	147	-16.9	68	65	-4.4
Maryland	916	699	-23.7	664	462	-30.4	252	237	-6.0
Massachusetts	1,168	909	-22.2	833	597	-28.3	335	312	-6.9
Michigan	2,181	1,761	-19.3	1,605	1,157	-27.9	576	605	5.0
Minnesota	921	715	-22.4	631	472	-25.2	290	244	-15.9
Mississippi	534	468	-12.4	388	327	-15.7	146	141	-3.4
Missouri	1,039	803	-22.7	740	547	-26.1	291	256	-12.0
Montana	177	152	-14.1	121	107	-11.6	56	45	-19.6
Nebraska	329	269	-18.2	230	186	-19.1	99	83	-16.2
Nevada	128	151	18.0	93	97	4.3	35	54	54.3
New Hampshire	159	160	0.6	114	107	-6.1	45	53	17.8
New Jersey	1,482	1,173	-20.8	1,063	777	-26.9	419	396	-5.5
New Mexico	281	269	-4.3	199	190	-4.5	82	79	-3.7
New York	3,477	2,719	-21.8	2,448	1,761	-28.1	1,029	957	-7.0
North Carolina	1,192	1,097	-8.0	836	769	-8.0	356	328	-7.9
North Dakota	147	117	-20.4	100	81	-19.0	47	36	-23.4
Ohio	2,426	1,860	-23.3	1,698	1,258	-25.9	728	602	-17.3
Oklahoma	627	594	-5.3	437	423	-3.2	190	171	-10.0
Oregon	480	448	-6.7	325	309	-4.9	155	139	-10.3
Pennsylvania	2,364	1,784	-24.5	1,635	1,157	-29.2	728	627	-13.9
Rhode Island	188	139	-26.1	135	89	-34.1	53	50	-5.7
South Carolina	638	609	-4.5	459	424	-7.6	179	184	2.8
South Dakota	166	124	-25.3	114	86	-24.6	52	38	-26.9
Tennessee	900	828	-8.0	649	591	-8.9	251	237	-5.6
Texas	2,840	2,986	5.1	2,046	2,150	5.1	794	836	5.3
Utah	304	370	21.7	213	275	29.1	91	95	4.4
Vermont	103	91	-11.7	74	64	-13.5	29	27	-6.9
Virginia	1,079	976	-9.5	776	683	-12.0	303	293	-3.3
Washington	818	738	-9.7	573	508	-11.3	245	232	-5.3
West Virginia	400	375	-6.3	281	267	-5.0	119	108	-9.2
Wisconsin	994	785	-21.0	679	504	-25.8	315	281	-10.8
Wyoming	87	107	23.0	60	74	23.3	27	27	0

NOTE: Details may not add to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Statistics of Public Schools, Fall 1970*, 1971, and unpublished revisions; and Common Core of Data, Part IV—Enrollment, Fall 1982, unpublished tabulations (November 1983).

Chart 1.2

Percent Change in Public Elementary/Secondary School Enrollment Between 1970 and 1982, by State


ID
WY
NV
UT
AZ
TX
LA
FL
RI
NJ
DE
DC
AK
HI
☐ Increased
▨ Decreased less than or equal to national average (−13.6 percent)
■ Decreased more than national average (−13.6 percent)

Between 1970 and 1982, public school enrollment declined by 14 percent nationally. Most Northeast and North Central States experienced declines greater than the national average, while nine States located mainly in the South and West recorded enrollment increases.

Table 1.3

Racial/Ethnic Distribution of Public Elementary/Secondary School Enrollment, by State: Fall 1980 and Change From Fall 1970

State	Percentage Distribution in 1980								Change from 1970 to 1980, in Percentage Points
	Total	White Non-Hispanic	Total Minority	Black Non-Hispanic	Hispanic	American Indian/ Alaskan Native	Asian or Pacific Islander	Percent Minority in 1970	
United States	100.0	73.3	26.7	16.1	8.0	0.8	1.9	20.7	6.0
Alabama	100.0	66.4	33.6	33.1	.1	.2	.2	34.3	-.7
Alaska	100.0	71.6	28.4	3.9	1.6	20.6	2.3	17.5	10.9
Arizona	100.0	66.3	33.7	4.2	24.2	4.1	1.1	28.9	4.8
Arkansas	100.0	76.5	23.5	22.5	.3	.4	.3	25.1	-1.6
California	100.0	57.1	42.9	10.1	25.3	.9	6.6	27.3	15.6
Colorado	100.0	77.9	22.1	4.6	15.3	.5	1.7	18.8	3.3
Connecticut	100.0	83.0	17.0	10.2	5.8	.1	.9	12.2	4.8
Delaware	100.0	71.2	28.8	25.9	1.8	.1	.9	21.4	7.4
District of Columbia	100.0	3.6	96.4	93.4	2.0	0	1.0	(*)	(*)
Florida	100.0	67.8	32.2	23.4	7.9	.1	.8	27.9	4.3
Georgia	100.0	65.7	34.3	33.5	.3	0	.5	33.5	.8
Hawaii	100.0	24.8	75.2	1.4	2.0	.2	71.4	(*)	(*)
Idaho	100.0	91.8	8.2	.5	4.6	2.1	1.0	4.3	3.9
Illinois	100.0	71.4	28.6	20.9	6.1	.1	1.5	22.0	6.6
Indiana	100.0	88.0	12.0	9.9	1.5	.1	.5	10.3	1.7
Iowa	100.0	95.9	4.1	2.2	.8	.2	.9	2.2	1.9
Kansas	100.0	87.3	12.7	7.8	3.0	.6	1.2	8.8	3.9
Kentucky	100.0	90.9	9.1	8.7	.1	0	.3	9.3	-.2
Louisiana	100.0	56.6	43.4	41.5	.8	.4	.8	41.0	2.4
Maine	100.0	99.1	.9	.3	.1	.2	.3	.8	.1
Maryland	100.0	66.5	33.5	30.6	.9	.2	1.8	24.9	8.6
Massachusetts	100.0	89.3	10.7	6.2	3.3	.1	1.1	6.0	4.7
Michigan	100.0	78.7	21.3	17.9	1.8	.8	.8	15.1	6.2
Minnesota	100.0	94.1	5.9	2.1	.7	1.6	1.5	2.6	3.3
Mississippi	100.0	48.4	51.6	51.0	.1	.1	.4	51.0	.6
Missouri	100.0	85.2	14.8	13.8	.5	.1	.5	15.1	-.3
Montana	100.0	85.9	14.1	.3	1.1	12.0	.8	7.3	6.8
Nebraska	100.0	89.5	10.5	5.6	1.9	2.2	.8	7.1	3.4
Nevada	100.0	81.1	18.9	9.5	5.2	2.0	2.2	14.3	4.6
New Hampshire	100.0	98.7	1.3	.5	.4	0	.4	.8	.5
New Jersey	100.0	71.6	28.4	18.5	8.0	.1	1.7	20.0	8.4
New Mexico	100.0	43.0	57.0	2.2	46.5	7.6	.6	48.1	8.9
New York	100.0	68.0	32.0	17.9	12.0	.2	2.0	25.3	6.7
North Carolina	100.0	68.1	31.9	29.8	.2	1.6	.4	30.7	1.2
North Dakota	100.0	96.5	3.5	.5	.5	1.8	.7	2.0	1.5
Ohio	100.0	85.3	14.7	13.1	1.0	.1	.6	13.0	1.7
Oklahoma	100.0	79.2	20.8	9.3	1.6	9.1	.8	16.0	4.8
Oregon	100.0	91.5	8.5	2.1	2.6	1.7	2.2	4.5	4.0
Pennsylvania	100.0	85.1	14.9	12.4	1.5	.2	.7	12.6	2.3
Rhode Island	100.0	91.8	8.2	4.7	2.1	.3	1.1	4.9	3.3
South Carolina	100.0	56.5	43.5	42.8	.2	.1	.4	41.2	2.3
South Dakota	100.0	92.1	7.9	.2	.2	7.2	.3	5.7	2.2
Tennessee	100.0	75.5	24.5	24.0	.1	0	.4	21.2	3.3
Texas	100.0	54.1	45.9	14.4	30.4	.2	1.1	37.1	8.8
Utah	100.0	92.7	7.3	.5	3.5	1.8	1.5	6.2	1.1
Vermont	100.0	99.0	1.0	.3	.1	.1	.5	.4	.6
Virginia	100.0	72.5	27.5	25.5	.5	.1	1.4	24.7	2.8
Washington	100.0	85.9	14.1	3.4	4.0	3.0	3.7	7.0	7.1
West Virginia	100.0	95.7	4.3	3.9	.1	0	.3	4.9	-.6
Wisconsin	100.0	90.7	9.3	6.2	1.5	.9	.7	6.0	3.3
Wyoming	100.0	92.5	7.5	.7	5.3	1.0	.4	8.9	-1.4

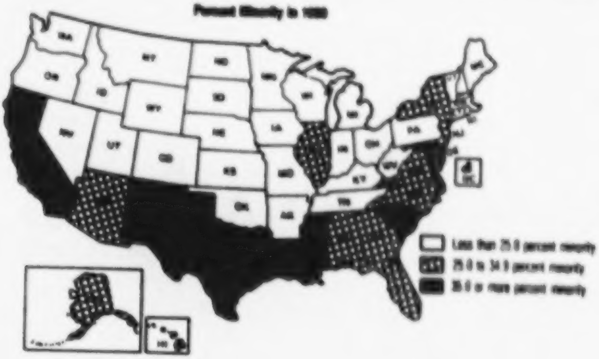
*Not available.

SOURCE: U.S. Department of Education, Office for Civil Rights, *1980 Elementary and Secondary Civil Rights Survey, National Summaries*, 1982, and *State Summaries*, 1982, projected data, and unpublished tabulations (December 1983).

Chart 1.3

Minority Enrollment as Percent of Public Elementary/Secondary School Enrollment, by State

Percent Minority in 1980



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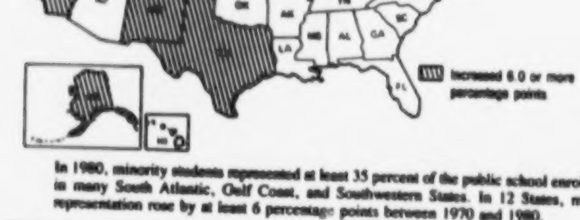
HI
Less than 25.0 percent minority
25.0 to 34.9 percent minority
35.0 or more percent minority

Percentage Point Change From 1970 in Percent Minority



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Increased 6.0 or more percentage points

In 1980, minority students represented at least 35 percent of the public school enrollments in many South Atlantic, Gulf Coast, and Southwestern States. In 12 States, minority representation rose by at least 6 percentage points between 1970 and 1980.

Table 1.4

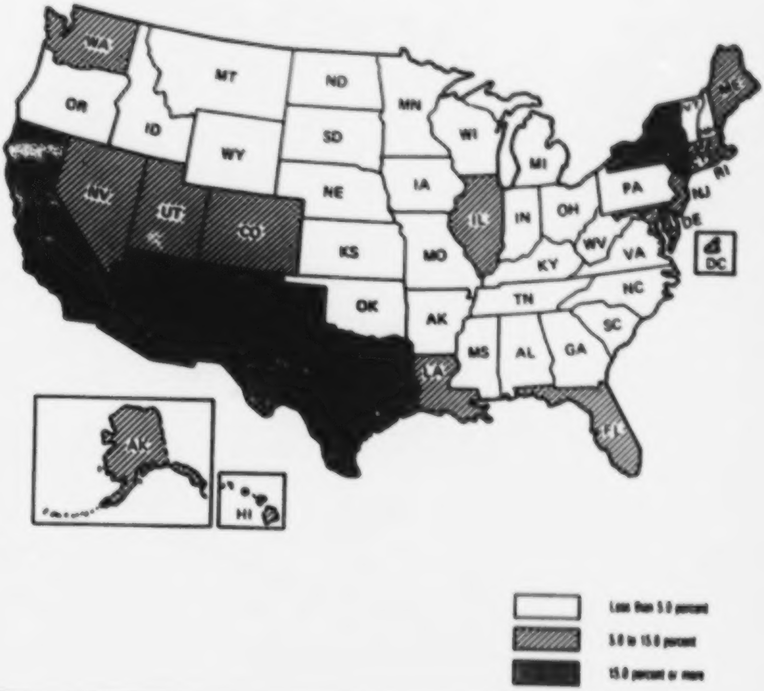
Number and Distribution of Population 5 to 17 Years Old Who Speak Non-English Language at Home, by State: April 1980

State	Total Population 5 to 17 Years Old, in Thousands	Those Who Speak Non-English Language at Home, in Thousands	Percent of Total Population	Percentage Distribution of Those Who Speak Non-English Language at Home
United States	47,494	4,568	9.7	100.0
Alabama	[illegible]	15	1.7	.3
Alaska	92	10	10.7	.2
Arizona	579	138	30.5	2.8
Arkansas	[illegible]	8	1.8	.2
California	4,[illegible]	1,076	20.8	23.5
Colorado	584	48	8.8	1.0
Connecticut	630	71	11.8	1.5
Delaware	125	6	4.8	.1
District of Columbia	109	9	8.4	.1
Florida	1,780	208	11.8	4.5
Georgia	1,228	28	3.3	.6
Hawaii	198	30	14.8	.6
Idaho	214	10	4.7	.2
Illinois	2,437	236	9.6	5.1
Indiana	1,201	43	3.6	.9
Iowa	608	16	2.7	.4
Kansas	460	17	3.7	.4
Kentucky	802	13	1.6	.3
Louisiana	972	90	9.1	1.1
Maine	244	13	5.3	.3
Maryland	880	46	5.1	1.0
Massachusetts	1,150	107	9.2	2.3
Michigan	2,090	81	3.9	1.8
Minnesota	867	25	2.9	.5
Mississippi	602	11	1.8	.2
Missouri	1,011	25	2.5	.5
Montana	167	5	3.3	.1
Nebraska	325	9	2.8	.2
Nevada	160	12	7.5	.3
New Hampshire	190	9	4.7	.2
New Jersey	1,531	205	13.4	4.5
New Mexico	303	111	36.6	2.4
New York	3,560	614	17.2	13.4
North Carolina	1,250	26	2.1	.6
North Dakota	137	4	2.8	.1
Ohio	2,300	87	3.8	1.9
Oklahoma	603	21	3.4	.5
Oregon	525	24	4.5	.5
Pennsylvania	2,380	112	4.7	2.5
Rhode Island	187	19	10.0	.4
South Carolina	700	16	2.3	.3
South Dakota	148	7	4.8	.2
Tennessee	975	17	1.8	.4
Texas	3,143	804	25.6	17.5
Utah	350	19	5.5	.4
Vermont	110	4	3.4	.1
Virginia	1,114	43	3.9	.9
Washington	834	47	5.6	1.0
West Virginia	414	7	1.7	.2
Wisconsin	1,013	34	3.3	.7
Wyoming	101	4	4.2	.1

SOURCE: U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Census Summary Tape File 3C, unpublished tabulations (January 1984).

Chart 1.4

Percent of 5- to 17-Years-Olds That Speak a Language Other Than English at Home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Less than 5.0 percent
5.0 to 15.0 percent
15.0 percent or more

Table 1.5

Estimated Language-Minority[1] Status and English Language Proficiency[2] of Population 5 to 14 Years Old: Selected Years, 1976 to 1982

Characteristic	Numbers (Estimated), in Thousands			Percent Change	
	Spring 1976	Spring 1978	Fall 1982	1976 to 1982	1978 to 1982
Total population 5 to 14 years old	37,644	[3]36,220	[3]33,980	−9.7	−6.2
Language minority[1]	3,538	3,812	4,505	+27.3	+18.2
Language minority as percent of total population	9.4	10.5	13.3	+41.0	+26.7
Limited-English proficient (LEP)[2]	—	2,409	2,657	—	+10.3
LEP as percent of all language minority	—	63.2	59.0	—	−6.6
All other 5- to 14-year-olds	34,106	[3]32,408	[3]29,475	−13.6	−9.4
Limited-English proficient (LEP)[2]	—	—	12,468	—	—
LEP as percent of all other 5- to 14-year-olds	—	—	42.3	—	—

[1] Language minority children are defined as members of households where the usual or second, often-spoken household language is other than English.

[2] Limited-English proficient estimates include all children scoring below specified cutoffs on special tests of English proficiency (originally developed for the 1978 Children's English and Services Study), plus children judged to be unable to complete the test or not tested due to refusal.

[3] Numbers are based on Current Population Estimates.

SOURCE: Unpublished tabulations (January 1983) prepared by U.S. Department of Education, Office of Planning, Budget and Evaluation from data collected by U.S. Department of Commerce, Bureau of the Census, 1976 Survey of Income and Education; 1982 English Language Proficiency Survey, preliminary estimates; and U.S. Department of Education, National Institute of Education, 1978 Children's English and Services Study.

Chart 1.5

Estimated Language Minority Status and English Language Proficiency of Population 5 to 14 Years Old

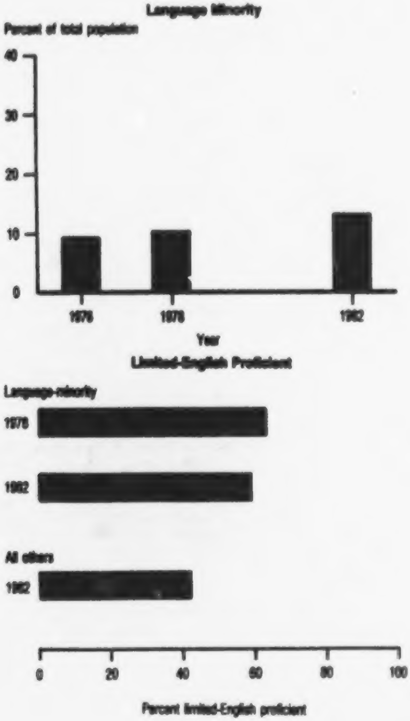


Table 1.6

Persons 3 to 21 Years Old Served Annually in Educational Programs for the Handicapped, Percentage Distribution, and Percent of Total Public School Enrollment, by Type of Handicap: 1976-77 to 1982-83

Type of Handicap	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
			Number Served, in Thousands				
All conditions	3,692	3,751	3,889	4,005	4,142	4,198	4,255
Learning disabled	796	964	1,130	1,276	1,462	1,622	1,741
Speech impaired	1,302	1,223	1,214	1,186	1,168	1,135	1,131
Mentally retarded	959	933	901	869	829	786	757
Emotionally disturbed	283	288	300	329	346	339	352
Hard of hearing and deaf	87	85	85	80	79	75	73
Orthopedically handicapped	87	87	70	66	58	58	57
Other health impaired	141	135	105	106	98	79	50
Visually handicapped	38	35	32	31	31	29	28
Multihandicapped	*	*	50	60	68	71	63
Deaf-blind	*	*	2	2	3	2	2
			Percentage Distribution of Persons Served				
All conditions	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Learning disabled	21.5	25.7	29.1	31.9	35.3	38.6	40.9
Speech impaired	35.3	32.6	31.2	29.6	28.2	27.0	26.6
Mentally retarded	26.0	24.9	23.2	21.7	20.0	18.7	17.8
Emotionally disturbed	7.6	7.7	7.7	8.2	8.4	8.1	8.3
Hard of hearing and deaf	2.4	2.3	2.2	2.0	1.9	1.8	1.7
Orthopedically handicapped	2.3	2.3	1.8	1.6	1.4	1.4	1.3
Other health impaired	3.8	3.6	2.7	2.6	2.4	1.9	1.2
Visually handicapped	1.0	.9	.8	.8	.8	.7	.7
Multihandicapped	—	—	1.3	1.5	1.6	1.7	1.5
Deaf-blind	—	—	.1	.1	.1	.1	.1
			As Percent of Total Enrollment				
All conditions	8.33	8.61	9.14	9.62	10.11	10.47	10.73
Learning disabled	1.80	2.21	2.66	3.06	3.57	4.05	4.39
Speech impaired	2.94	2.81	2.85	2.85	2.85	2.83	2.85
Mentally retarded	2.16	2.14	2.12	2.09	2.02	1.96	1.91
Emotionally disturbed	.64	.66	.71	.79	.85	.85	.89
Hard of hearing and deaf	.20	.20	.20	.19	.19	.19	.18
Orthopedically handicapped	.20	.20	.16	.16	.14	.14	.14
Other health impaired	.32	.31	.25	.25	.24	.20	.13
Visually handicapped	.09	.08	.08	.08	.08	.07	.07
Multihandicapped	—	—	.12	.14	.17	.18	.16
Deaf-blind	—	—	.01	.01	.01	.01	.01

*Not available.

—Not applicable.

NOTE: Child counts are based on reports from the 50 States and District of Columbia only (i.e., figures from U.S. territories are not included). Percentages of total enrollment are based on the total annual enrollment of U.S. public schools, preprimary through 12th grade. Details may not add to totals because of rounding.

SOURCE: Calculated from U.S. Department of Education, Office of Special Education and Rehabilitative Services, *Fifth Annual Report to Congress on the Implementation of Public Law 94-142*, Appendix 2, Table F (1983), and unpublished tabulations.

Chart 1.6

Persons 3 to 21 Years Old Served in Special Education Programs for the Handicapped

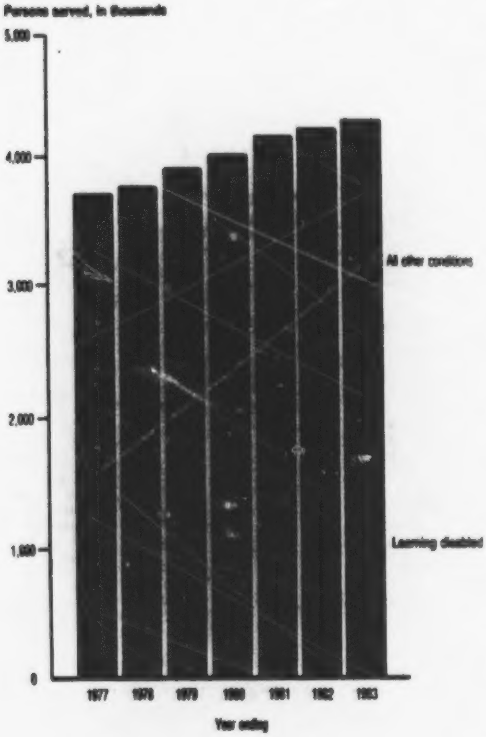


Table 1.7

Trends in Preprimary Enrollment,[1] by Age of Student and Control of School: Fall 1970 to Fall 1992

(In Thousands)

Fall of Year	Total	Public School Enrollment					Private School Enrollment				
		Total	3 Years Old	4 Years Old	5 Years Old	6 Years Old	Total	3 Years Old	4 Years Old	5 Years Old	6 Years Old
1970	4,279	2,981	123	494	2,214	150	1,298	332	512	429	25
1971	4,330	3,007	107	486	2,254	160	1,323	323	562	417	21
1972	4,417	[illegible]	[illegible]	532	[illegible]	[illegible]	1,301	385	[illegible]	387	21
1973	[illegible]	[illegible]	137	516	2,175	152	1,417	378	[illegible]	[illegible]	12
1974	[illegible]	3,149	178	543	[illegible]	148	[illegible]	[illegible]	778	413	12
1975	5,141	3,425	191	645	2,417	172	1,716	492	773	437	14
1976	[illegible]	3,418	180	[illegible]	2,451	179	1,579	422	740	[illegible]	27
1977	[illegible]	[illegible]	[illegible]	591	2,242	184	[illegible]	447	[illegible]	400	35
1978	4,813	3,161	233	601	2,132	195	1,652	526	712	379	36
1979	[illegible]	[illegible]	232	[illegible]	2,177	215	[illegible]	514	787	348	16
1980	5,162	3,322	237	602	2,227	256	1,840	620	821	370	29
1981	[illegible]	[illegible]	298	580	2,176	247	[illegible]	623	853	427	36
1982	[illegible]	3,476	340	602	2,247	287	[illegible]	[illegible]	[illegible]	434	50
					Projected[2]						
1983	5,472	3,485	330	642	2,248	265	1,987	625	903	414	45
1984	5,740	[illegible]	345	[illegible]	2,344	254	[illegible]	640	[illegible]	433	45
1985	6,018	3,844	362	718	2,489	275	2,174	[illegible]	1,010	458	45
1986	6,171	3,925	378	743	2,512	292	2,246	690	1,046	463	47
1987	6,327	4,007	395	768	2,549	295	2,320	722	1,080	470	48
1988	6,476	4,084	412	794	2,579	299	2,392	752	1,116	476	48
1989	[illegible]	[illegible]	426	819	2,612	303	[illegible]	761	1,151	482	49
1990	6,767	4,236	444	842	2,643	307	2,531	[illegible]	1,184	486	50
1991	6,888	4,297	457	864	2,665	311	2,591	836	1,213	492	50
1992	6,991	4,349	470	882	2,683	314	2,642	858	1,240	494	50

---

[1] Includes prekindergarten and kindergarten enrollments in regular public schools and enrollments in independently operated public and private nursery schools and kindergartens.

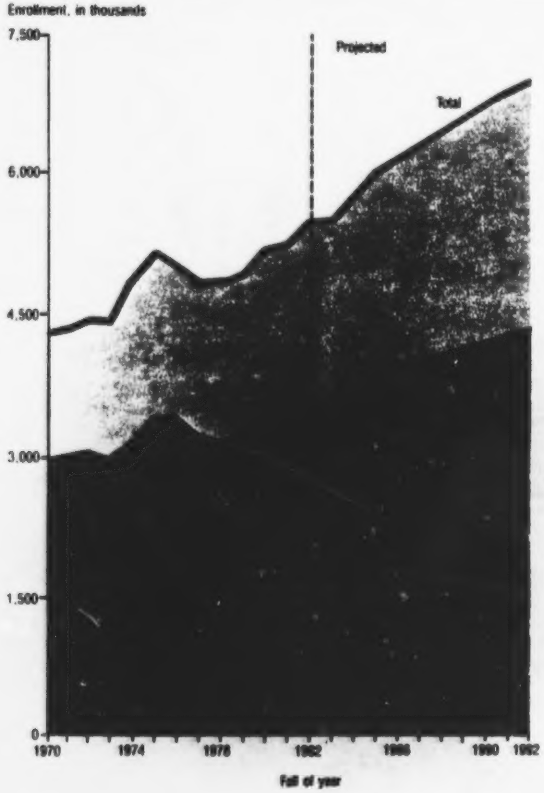
[2] For methodological details, see *Projections of Education Statistics to 1992-93*, forthcoming.

NOTE: Details may not add to totals because of rounding.

SOURCE: U.S. Department of Commerce, Bureau of the Census, *Current Population Reports, Nursery School and Kindergarten Enrollment*, Series P-20; and U.S. Department of Education, National Center for Education Statistics, *Preprimary Enrollment*, various years, and *Projections of Education Statistics to 1992-93*, forthcoming.

Chart 1.7

Preprimary Enrollment, by Control of School



Preprimary enrollment is projected to increase throughout the 1980's and into the 1990's in both public and private nursery schools and kindergartens.

Table 1.8

Public Preprimary Enrollment Compared to 1st Grade Enrollment, by State: Fall 1970 and Fall 1982

State	Enrollment in Fall 1970			Enrollment in Fall 1982		
	Preprimary[1]	1st Grade	Preprimary as Percent of 1st Grade	Preprimary[1]	1st Grade	Preprimary as Percent of 1st Grade
United States	[2]2,557,294	3,810,178	67.1	2,839,308	2,936,422	96.7
Alabama	1,[illegible]	78,843	2.2	36,736	58,351	63.0
Alaska	5,457	7,236	75.4	7,407	7,325	101.1
Arizona	13,017	38,218	34.1	37,869	38,757	97.7
Arkansas	(*)	42,853	(*)	30,235	34,290	88.2
California	335,875	363,610	92.4	313,584	308,356	101.7
Colorado	38,174	41,287	92.4	41,400	40,801	101.5
Connecticut	57,625	55,410	104.0	37,872	34,870	108.6
Delaware	7,730	11,288	68.5	6,169	6,361	97.0
District of Columbia	12,509	13,632	91.8	9,145	7,445	122.8
Florida	47,211	119,625	39.5	99,595	107,420	92.7
Georgia	13,812	105,866	13.1	69,332	82,690	83.8
Hawaii	13,610	14,346	94.9	12,790	12,311	103.9
Idaho	(*)	16,088	(*)	16,115	17,581	91.7
Illinois	104,914	106,776	98.3	154,547	137,108	112.7
Indiana	81,346	102,665	79.2	70,423	73,966	95.2
Iowa	50,747	49,899	101.7	39,663	35,681	111.1
Kansas	36,681	36,126	101.5	32,629	30,782	106.0
Kentucky	4,240	69,629	6.1	44,857	52,378	85.6
Louisiana	25,542	77,795	32.8	59,580	68,785	86.6
Maine	18,318	20,193	90.7	15,293	15,051	101.6
Maryland	64,133	67,151	95.5	51,636	45,882	112.5
Massachusetts	65,752	98,731	66.6	59,512	60,075	99.1
Michigan	198,445	183,179	108.3	125,153	113,917	109.9
Minnesota	64,894	67,418	96.3	56,035	48,729	115.0
Mississippi	449	61,170	0.7	5,833	42,218	13.8
Missouri	74,061	89,572	82.7	59,394	57,839	102.7
Montana	3,330	13,812	24.1	11,467	12,340	92.9
Nebraska	24,000	24,270	98.9	22,810	20,077	113.6
Nevada	9,410	11,107	84.7	10,552	11,178	94.4
New Hampshire	5,216	14,926	34.9	4,182	12,957	32.3
New Jersey	125,521	118,302	106.1	80,340	76,482	105.0
New Mexico	3,196	25,225	12.7	19,956	21,072	94.7
New York	267,090	279,626	95.5	179,531	180,950	99.2
North Carolina	7,499	104,742	7.2	76,787	78,641	97.6
North Dakota	2,569	11,358	22.6	9,262	9,405	98.5
Ohio	175,302	190,866	91.8	138,441	132,241	104.7
Oklahoma	33,053	51,473	64.2	48,511	48,008	101.0
Oregon	9,665	37,999	25.4	22,981	36,070	63.7
Pennsylvania	159,869	165,958	96.3	117,879	118,775	99.2
Rhode Island	14,912	14,189	105.1	9,180	9,452	97.1
South Carolina	6,163	58,847	10.5	37,730	47,362	79.7
South Dakota	9,357	12,272	76.2	10,373	9,779	106.1
Tennessee	13,140	87,431	15.0	58,251	64,013	91.0
Texas	79,690	250,760	31.8	219,423	250,427	87.6
Utah	21,170	22,375	94.6	37,274	34,654	107.6
Vermont	3,855	8,480	45.5	5,214	7,098	73.5
Virginia	25,732	93,954	27.4	68,465	69,086	99.1
Washington	52,784	63,824	82.7	56,560	54,520	103.7
West Virginia	1,385	36,214	3.8	25,197	29,433	85.6
Wisconsin	83,341	74,364	112.1	64,631	49,304	131.1
Wyoming	4,646	6,483	71.7	8,932	8,526	104.8

*Not available.

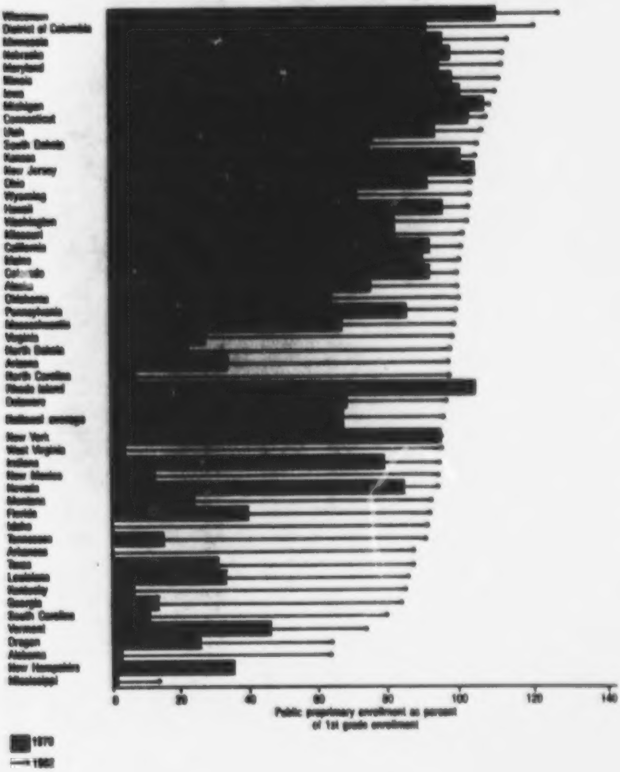
[1] Includes nursery schools and kindergartens operated as part of the regular public school system. Preprimary enrollment can exceed first grade enrollment, as shown in percentages of over 100.0 percent, because it may include nursery school enrollment and students served part-time.

[2] Includes estimates for nonreporting States.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Statistics of Public Schools: Fall 1970*, 1971; and Common Core of Data, Part IV—Enrollment: Fall 1982, unpublished tabulations (November 1983).

Chart 1.8

Public Preprimary Enrollment Compared to 1st Grade Enrollment



Preprimary enrollment in the public schools equaled or exceeded 1st grade enrollment in some States in 1982. Many States with low preprimary enrollments in 1970 greatly expanded their programs over the ensuing decade.

Table 1.9

Number, Enrollment, and Average Enrollment Size of Public Elementary/Secondary Schools, by Level of School and Grade Span Served: 1970-71 and 1980-81

Level[1] and Grade Span	1970-71			1980-81		
	Number of Schools[2]	Enrollment, in Thousands	Average Enrollment Size[3]	Number of Schools[2]	Enrollment, in Thousands	Average Enrollment Size[3]
Total schools	90,540	45,380	504	85,982	40,862	483
Elementary schools	61,060	24,886	409	54,234	20,361	378
Preprimary (or 1st) only (prekindergarten, kindergarten, or 1st grade)	984	228	229	1,189	429	376
Preprimary (or 1st) to 2nd	881	215	245	884	236	276
Preprimary (or 1st) to 5th	5,727	2,550	447	8,965	3,730	418
Preprimary (or 1st) to 6th	32,636	14,885	456	25,910	9,950	401
Preprimary (or 1st) to 7th	1,979	820	414	1,020	392	388
Preprimary (or 1st) to 8th	9,854	3,338	339	6,710	1,800	274
Any combination of 4th, 5th, or 6th	1,630	507	311	1,687	587	354
Other spans, lowest grade less than 5th and highest grade to 8th[4]	2,351	547	295	3,979	1,580	401
Junior high or middle schools	10,385	7,380	710	11,569	6,894	603
5th to 8th	722	368	510	944	453	480
6th to 8th	1,862	1,050	567	3,144	1,857	585
7th to 8th	2,480	1,250	510	2,509	1,259	498
7th to 9th	4,711	4,120	875	3,338	2,477	744
Other spans, lowest grade 5th or higher and highest grade 7th to 9th[4]	660	546	845	1,616	848	594
Secondary schools, including high schools	15,507	12,040	776	16,066	12,487	787
7th to 12th	4,114	2,025	492	5,677	1,981	352
8th to 12th	545	401	736	495	332	671
9th to 12th	7,242	5,598	773	6,176	5,895	862
10th to 12th	3,147	3,705	1,177	2,440	2,733	1,123
Other spans, lowest grade 7th or higher and highest grade 10th to 12th[4]	459	313	682	1,284	1,118	875
Combined elementary/secondary schools	1,330	844	635	1,886	782	467
Preprimary (or 1st) to 12th	883	562	639	1,384	585	529
Other combined spans[5]	447	282	586	502	197	395
Schools not classified by both lowest and highest[6]	2,248	431	192	2,290	278	148

---

[1] Level of school is a classification based on lowest and highest grades served and, in those cases where the lowest or highest grade is unclassified, on institutional reports. Elementary includes schools with lowest grade less than 5th and no grade higher than 8th, except for the few schools organized with only 5th to 8th grades. Junior high and middle schools have no grade lower than 5th and no grade higher than 9th. Secondary schools have no grade lower than 7th and the highest grade 10th, 11th, or 12th. Combined elementary/secondary schools span the elementary through secondary grades.

[2] Number of schools may include schools for which enrollment data were missing or equal to zero.

[3] Average enrollment size was computed for schools that reported enrollments greater than zero. These schools numbered 90,042 in 1970-71 and 84,580 in 1980-81. Consequently, average enrollment size computed by dividing enrollment by total number of schools will only approximate the figures shown in this table.

[4] These schools include spans with unclassified lowest or highest grade. In these cases, the classification of level is based on institutional reports.

[5] These combined elementary/secondary schools were characterized by three typical spans: the lowest grade less than 5th and the highest grade 9th; or the lowest grade less than 7th and the highest grade 10th or 11th; or the lowest grade 2nd thru 6th and the highest grade 12th. The preponderance of these schools classified themselves as combined elementary/secondary.

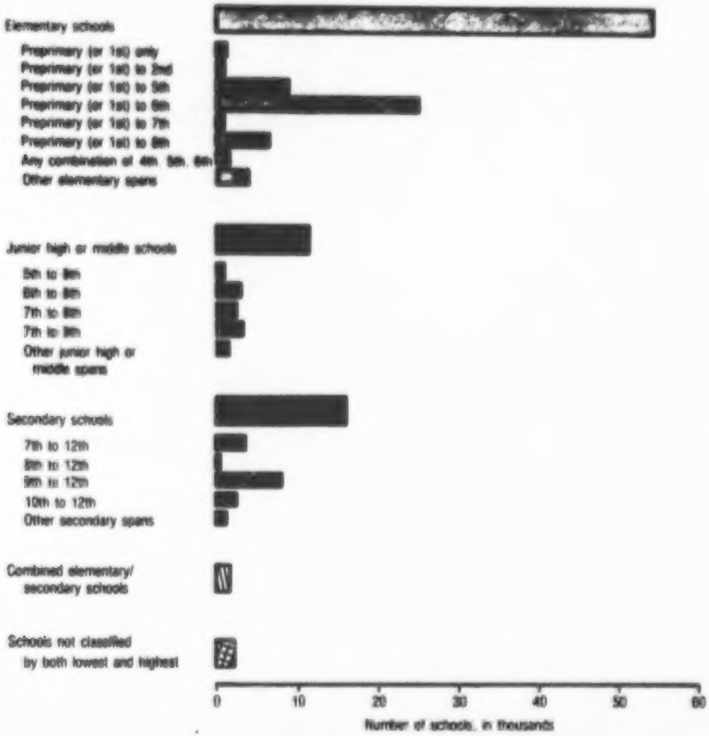
[6] These schools were characterized by both unclassified lowest and highest grades. A majority of these schools classified themselves as special education schools.

NOTE: Data shown in this table, particularly for 1970-71, differ from those reported elsewhere in this and previous publications because they are derived from the school universe surveys, not the annual State reports, and are categorized according to a different classification scheme. Data for schools in three States in 1970-71 were missing or significantly underreported and were replaced with 1971-72 data. With this adjustment, 1 percent more schools and 1 percent fewer students were reported from the school universe survey than from the annual 1970-71 report. For 1980-81, the school universe survey figures were only slightly lower than the State annual reports, and no States were missing.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Elementary and Secondary General Information Survey, School Universe File, 1970-71, 1971-72, and Common Core of Data, School Universe File, 1980-81, unpublished tabulations (October 1982).

Chart 1.9

Number of Public Elementary/Secondary Schools, by Level of School and Grade Span: 1980-81



The organization of public elementary/secondary schools was as varied in 1980-81 as it had been in 1970-71. For example, in elementary, junior high/middle, and secondary schools, the most typical grade spans represented, at most, half of the schools and enrollments in 1980-81.

Table 1.10

Trends in Number of Classroom Teachers in Regular Elementary/Secondary Schools, by Control and Level of School: Fall 1970 to Fall 1992

(In Thousands)

Fall of Year	Total Teachers: Pre-primary to 12th Grade	Total Teachers: Elementary	Total Teachers: Secondary	Public School Teachers: Pre-primary to 12th Grade	Public School Teachers: Elementary	Public School Teachers: Secondary	Private School Teachers: Pre-primary to 12th Grade	Private School Teachers: Elementary	Private School Teachers: Secondary
1970	2,288	1,281	1,007	2,055	1,128	927	233	153	80
1971	2,293	1,263	1,030	2,063	1,111	952	[a]230	152	78
1972	2,334	1,294	1,040	2,103	1,140	963	[a]231	154	77
1973	2,369	1,306	1,063	2,133	1,149	984	[a]236	157	79
1974	2,410	1,331	1,079	2,165	1,167	998	[a]245	164	81
1975	2,451	1,352	1,099	2,196	1,180	1,016	[a]255	172	83
1976	2,454	1,349	1,105	2,186	1,166	1,020	268	183	85
1977	2,488	1,375	1,113	2,209	1,185	1,024	278	190	88
1978	2,479	1,376	1,103	2,207	1,190	1,016	273	186	87
1979	2,459	1,378	1,081	2,183	1,190	993	[a]276	188	88
1980[b]	2,439	1,365	1,074	2,162	1,177	985	277	188	89
1981	2,403	1,349	1,054	2,117	1,155	962	286	194	92
1982	2,401	1,362	1,039	[a]2,110	1,165	945	291	197	94
					Projected[c]				
1983	2,404	1,362	1,042	2,108	1,163	945	296	199	97
1984	2,401	1,358	1,043	2,108	1,162	946	293	196	97
1985	2,413	1,371	1,042	2,119	1,174	945	294	197	97
1986	2,438	1,403	1,035	2,135	1,198	937	303	205	98
1987	2,452	1,433	1,019	2,151	1,227	924	301	206	95
1988	2,468	1,472	996	2,162	1,258	904	306	214	92
1989	2,493	1,510	983	2,179	1,288	891	314	222	92
1990	2,527	1,550	977	2,209	1,321	888	318	229	89
1991	2,569	1,584	985	2,253	1,353	900	316	231	85
1992	2,624	1,618	1,006	2,299	1,379	920	325	239	86

[a] Estimated.

[b] Preliminary.

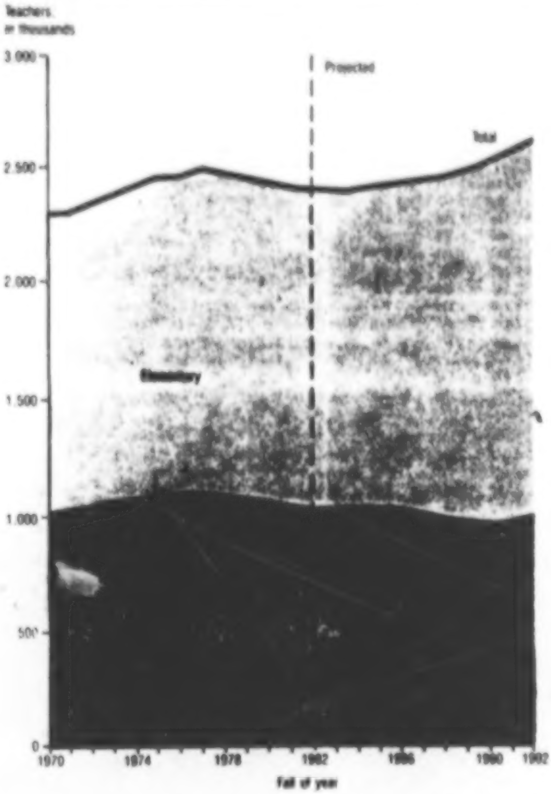
[c] For methodological details, see *Projections of Education Statistics to 1992-93*, forthcoming.

NOTE: Details may not add to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Statistics of Public Elementary and Secondary Day Schools*, various years; *Statistics of Nonpublic Elementary and Secondary Schools*, various years; and *Projections of Education Statistics to 1992-93*, forthcoming.

Chart 1.10

Elementary/Secondary Classroom Teachers, by Level



The number of public and private elementary school teachers is projected to increase steadily beginning in the mid-1980's, while the number of secondary school teachers is expected to decline until the 1990's.

Table 1.11

Trends in Number of Classroom Teachers per 1,000 Students in Regular Elementary/Secondary Schools, by Control and Level of School: Fall 1970 to Fall 1992

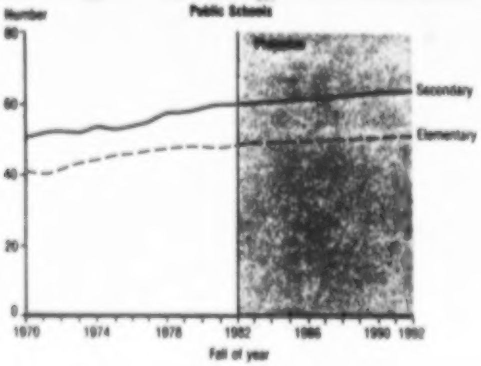
Fall of Year	Public School Teachers		Private School Teachers	
	Elementary	Secondary	Elementary	Secondary
1970	41.8	50.4	37.8	61.0
1971	40.1	51.8	39.4	61.3
1972	41.7	52.3	41.1	61.7
1973	43.5	51.6	42.7	62.1
1974	44.2	53.5	44.6	62.5
1975	46.0	53.1	46.2	62.9
1976	46.9	54.8	47.6	63.3
1977	47.5	56.6	50.0	63.8
1978	47.6	57.9	49.6	64.3
1979	48.5	58.1	51.1	65.4
1980	48.7	58.5	51.6	66.5
1981	48.5	60.1	52.3	67.2
1982	48.8	59.9	53.3	68.7
		Projected*		
1983	49.4	60.6	53.8	69.0
1984	49.6	61.0	54.4	69.2
1985	49.8	61.4	54.8	69.6
1986	50.1	61.8	55.3	69.8
1987	50.4	62.3	55.8	70.2
1988	50.6	62.8	56.3	70.4
1989	50.8	63.2	56.8	70.7
1990	51.0	63.6	57.2	71.0
1991	51.3	64.0	57.6	71.2
1992	51.5	64.4	58.2	71.6

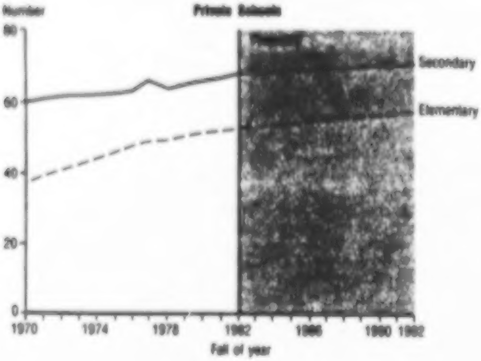
*For methodological details, see *Projections of Education Statistics to 1992-93*, forthcoming.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Statistics of Public Elementary and Secondary Day Schools*; *Statistics of Nonpublic Elementary and Secondary Schools*; and *Projections of Education Statistics to 1992-93*, forthcoming.

Chart 1.11

Classroom Teachers Per 1,000 Students in Elementary/Secondary Schools





The ratio of teachers to students is projected to rise somewhat in the 1980's and into the 1990's in public and private schools at both elementary and secondary levels. The increase is not expected to be as appreciable as in the 1970's.

Table 1.12

Trends in Estimated Demand for Classroom Teachers in Elementary/Secondary Schools and Estimated Supply of New Teacher Graduates: Fall 1970 to Fall 1992

(Numbers in Thousands)

Fall of Year	Total Estimated Teacher Demand	Estimated Demand for Additional Teachers					Estimated Supply of New Teacher Graduates[1]	Supply as Percent of Demand
		Total	Public	Private	Elementary	Secondary		
1970	2,288	208	192	16	115	93	284	136.5
1971	2,293	163	152	11	71	92	314	192.6
1972	2,334	179	164	15	107	72	317	177.1
1973	2,369	175	159	16	86	89	313	178.9
1974	2,415	183	160	23	103	80	279	152.5
1975	2,451	186	161	25	101	85	238	128.0
1976	2,454	150	122	28	78	72	222	148.0
1977	2,488	181	154	27	107	74	194	107.2
1973-77	12,172	875	753	122	478	397	1,246	142.4
1978	2,479	138	129	9	82	56	181	131.2
1979	2,456	129	109	20	85	44	163	126.4
1980	2,436	127	110	17	69	58	144	113.4
1981	2,403	110	85	25	66	44	141	128.2
1982	2,401	143	120	23	94	49	143	100.0
1978-82	12,180	647	553	94	396	251	772	119.3
					Projected[2]			
1983	2,404	148	125	23	82	66	146	98.6
1984	2,401	142	127	15	78	64	146	102.8
1985	2,418	157	138	19	95	62	146	93.0
1986	2,436	170	143	27	114	56	144	84.7
1987	2,452	160	144	16	114	46	142	88.8
1983-87	12,106	777	677	100	483	294	724	93.2
1988	2,466	164	140	24	126	38	139	84.8
1989	2,493	173	146	27	126	47	139	80.3
1990	2,527	183	160	23	131	52	139	76.0
1991	2,569	195	176	19	129	66	138	70.8
1992	2,624	209	181	28	129	80	137	65.6
1988-92	12,681	924	803	121	641	283	692	74.9

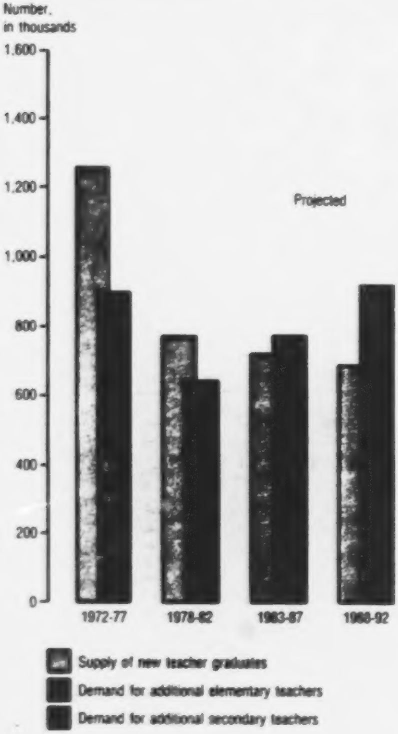
[1] Estimates for 1971 through 1980 are from National Education Association, *Teacher Supply and Demand in Public Schools, 1980-81*. Other estimates developed by the National Center for Education Statistics.

[2] For methodological details, see *Projections of Education Statistics to 1992-93*, forthcoming.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics to 1992-93*, forthcoming; and National Education Association, *Teacher Supply and Demand in Public Schools, 1980-81*, 1981, copyrighted.

Chart 1.12

Estimated Teacher Supply and Estimated Demand for Additional Teachers



Beginning in the mid-1980's, the demand for additional teachers is projected to exceed the supply of new teacher graduates. Elementary schools should provide two-thirds of this demand.

Table 1.13

Number of Public Elementary/Secondary Classroom Teachers, by State: Fall 1970 and Fall 1981

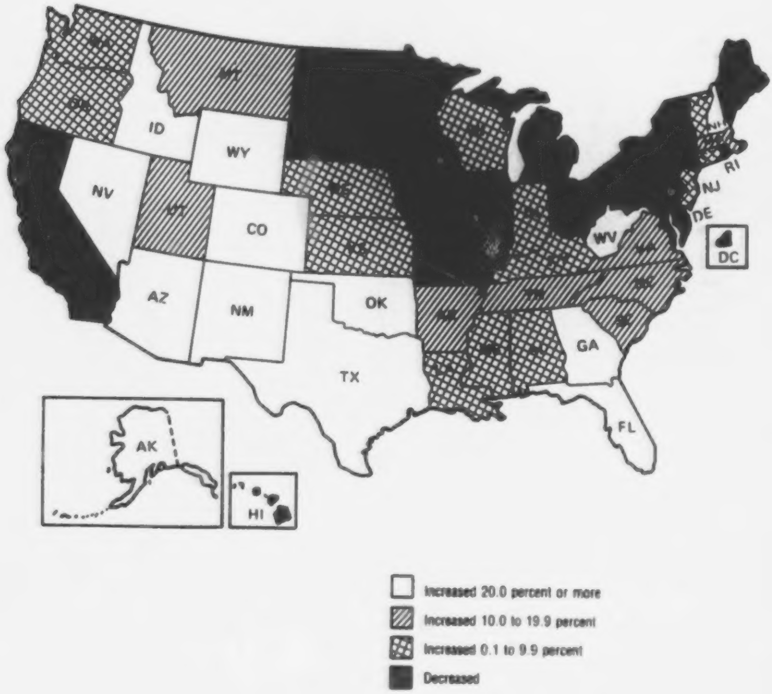
State	Classroom Teachers, in Full-Time Equivalents		
	Fall 1970	Fall 1981	Percent Change
United States	2,055,218	2,116,864	3.0
Alabama	33,026	34,224	3.6
Alaska	3,821	5,665	48.3
Arizona	18,772	25,601	36.4
Arkansas	21,122	23,497	11.2
California	193,000	170,007	−11.9
Colorado	23,817	29,119	22.3
Connecticut	31,323	33,723	7.7
Delaware	6,034	5,331	−11.7
District of Columbia	7,486	5,132	−31.4
Florida	62,419	74,872	20.0
Georgia	44,007	56,217	27.7
Hawaii	7,985	7,165	−10.3
Idaho	8,047	9,798	21.8
Illinois	111,827	103,793	−7.2
Indiana	50,421	51,303	1.7
Iowa	32,650	31,244	−4.3
Kansas	25,894	26,179	1.1
Kentucky	30,180	31,666	4.9
Louisiana	36,460	39,967	9.6
Maine	11,170	10,736	−3.9
Maryland	40,810	39,120	−4.1
Massachusetts	55,300	62,227	12.5
Michigan	93,000	78,768	−15.3
Minnesota	43,809	42,836	−2.2
Mississippi	22,533	24,430	8.4
Missouri	48,286	48,135	−0.3
Montana	8,406	9,310	10.8
Nebraska	17,230	17,410	1.0
Nevada	4,967	7,180	44.6
New Hampshire	*7,441	9,729	30.7
New Jersey	72,140	75,231	4.3
New Mexico	11,620	14,296	23.0
New York	177,086	157,201	−11.2
North Carolina	49,565	55,833	12.6
North Dakota	7,659	6,995	−8.7
Ohio	104,680	96,440	−7.9
Oklahoma	28,184	33,904	20.3
Oregon	21,641	22,480	3.9
Pennsylvania	106,465	106,221	−0.2
Rhode Island	8,986	8,895	−1.0
South Carolina	28,578	32,007	12.0
South Dakota	8,016	7,984	−0.4
Tennessee	35,450	40,075	13.1
Texas	129,440	159,640	23.3
Utah	11,350	12,983	14.4
Vermont	5,750	6,103	6.1
Virginia	47,903	55,471	15.8
Washington	*33,280	34,576	3.9
West Virginia	16,582	21,870	31.9
Wisconsin	*44,480	46,652	4.9
Wyoming	4,588	6,834	49.0

*Estimated

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Statistics of Public Elementary and Secondary Day Schools, Fall 1971*, 1971; and Common Core of Data, unpublished tabulations (November 1983).

Chart 1.13

Percent Change in Number of Public Elementary/Secondary Classroom Teachers Between 1970 and 1981, by State


WA
OR
ID
MT
WY
NV
UT
CO
AZ
NM
OK
TX
WV
NH
RI
NJ
DE
DC
GA
FL
AK
HI
Increased 20.0 percent or more
Increased 10.0 to 19.9 percent
Increased 0.1 to 9.9 percent
Decreased

While nationally, the number of public school classroom teachers was 3 percent more in 1981 than in 1970, in several States with growing enrollments, the increase was 20 percent or more. Decreases were registered in many Northeast and North Central States and in California and Hawaii.

Table 1.14

Current Expenditures per Pupil in Average Daily Attendance in Public Elementary/Secondary Schools, by State: 1970-71 and 1981-82

State	Current Expenditures¹ per Pupil in 1981-82	Current Expenditures per Pupil in 1970-71: Current (1970-71) Dollars	Current Expenditures per Pupil in 1970-71: Constant (1981-82) Dollars²	Percent Increase in Current Expenditures per Pupil from 1970-71: Current (1970-71) Dollars	Percent Increase in Current Expenditures per Pupil from 1970-71: Constant (1981-82) Dollars²
United States	$2,724	$911	$2,031	199.0	34.1
Alabama	2,063	605	1,349	241.0	52.9
Alaska	6,520	1,507	3,360	329.6	91.4
Arizona	2,490	783	1,745	214.4	41.1
Arkansas	1,841	600	1,337	206.8	37.7
California	2,671	905	2,019	194.8	32.3
Colorado	2,914	841	1,875	246.5	55.4
Connecticut	3,199	1,058	2,354	202.0	35.5
Delaware	3,199	1,047	2,334	205.4	37.0
District of Columbia	3,752	1,178	2,626	221.0	44.4
Florida	2,520	823	1,848	204.9	36.6
Georgia	1,998	714	1,592	180.8	17.9
Hawaii	2,852	1,023	2,280	178.8	25.5
Idaho	1,966	650	1,449	207.1	37.8
Illinois	2,966	1,065	2,369	183.4	27.2
Indiana	2,390	850	1,850	185.0	27.9
Iowa	2,826	901	2,009	213.7	40.7
Kansas	2,615	823	1,834	242.0	53.6
Kentucky	1,867	670	1,493	177.2	24.4
Louisiana	2,590	791	1,763	257.6	60.5
Maine	2,365	751	1,674	193.6	31.7
Maryland	3,526	1,039	2,316	211.4	39.7
Massachusetts	3,157	927	2,066	238.4	51.8
Michigan	3,145	1,007	2,245	212.3	40.1
Minnesota	2,955	1,049	2,338	178.9	24.3
Mississippi	1,705	602	1,342	183.4	27.1
Missouri	2,342	763	1,701	206.9	37.7
Montana	2,898	840	1,872	256.9	58.1
Nebraska	2,704	865	1,929	212.6	40.2
Nevada	2,424	820	1,828	195.6	32.6
New Hampshire	2,502	801	1,785	212.4	40.2
New Jersey	3,516	1,177	2,624	198.8	34.0
New Mexico	2,703	746	1,663	262.3	62.5
New York	4,588	1,567	3,493	173.1	22.5
North Carolina	2,089	695	1,549	208.0	37.3
North Dakota	2,729	742	1,654	267.8	65.0
Ohio	2,492	796	1,775	212.3	40.1
Oklahoma	2,667	675	1,507	294.5	77.0
Oregon	3,300	1,012	2,256	226.0	46.2
Pennsylvania	3,080	952	2,122	220.4	45.7
Rhode Island	3,540	1,002	2,233	253.4	58.1
South Carolina	1,876	659	1,469	184.7	27.7
South Dakota	2,298	776	1,730	196.4	32.9
Tennessee	1,866	609	1,358	204.2	36.4
Texas	2,229	703	1,567	217.1	42.2
Utah	1,931	701	1,563	175.5	23.5
Vermont	2,703	854	1,904	223.5	45.1
Virginia	2,387	792	1,766	202.7	35.0
Washington	2,820	929	2,068	185.6	38.1
West Virginia	2,598	728	1,616	257.2	60.3
Wisconsin	2,835	984	2,193	188.3	33.6
Wyoming	3,417	931	2,075	267.0	64.7

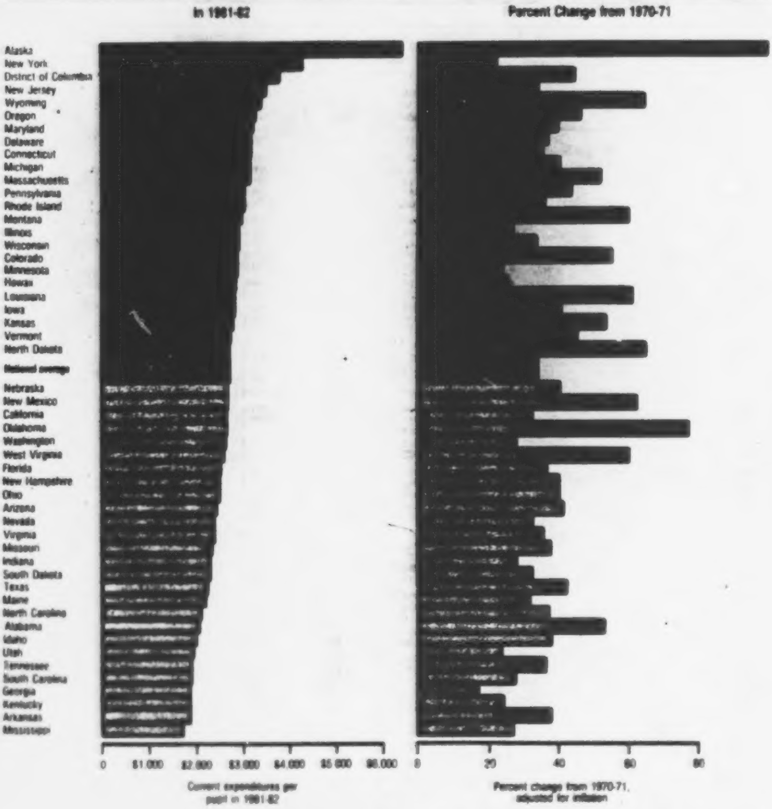
¹Includes expenditures for day schools only; excludes adult education, community colleges, and community services.
²Adjusted for inflation using the Index of State and Local Governments Purchases.

NOTE: Details may not add to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Expenditures and Revenues for Public Elementary and Secondary Education: 1970-71*, 1973, and Common Core of Data, unpublished tabulations (February, 1984).

Chart 1.14

Current Expenditures per Pupil in Public Elementary/Secondary Schools



Current expenditures per pupil were highest in Alaska and New York and lowest in Mississippi and Arkansas in 1981-82. From 1970-71 to 1981-82, Alaska and Oklahoma registered the largest increases, while New York and Georgia recorded the smallest.

Table 1.15

Selected Fiscal and Demographic Features of the States, Indexed to National Average: 1971-72 and 1981-82

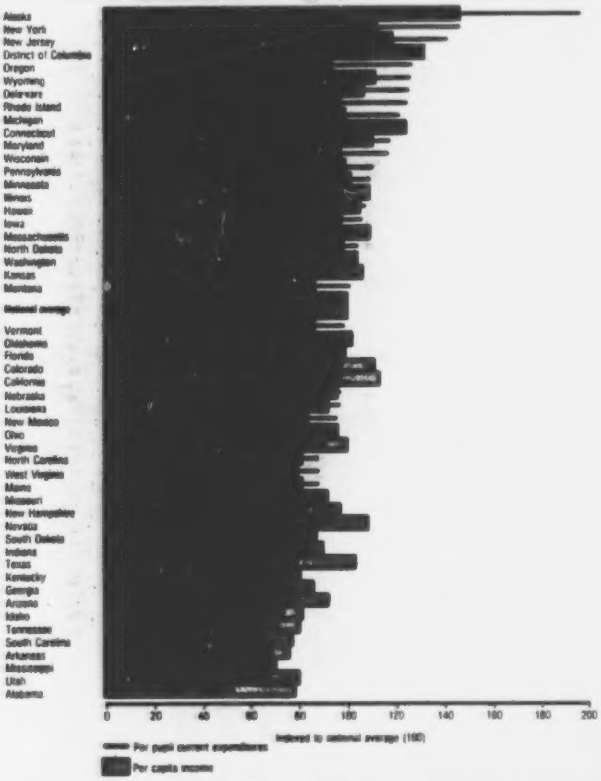
State	1971-72 Per Capita Income	1971-72 State/Local School Tax Efforts	1971-72 Education's Share of State/Local Expenditures	1971-72 Public School Students as Percent of Population	1971-72 Current Expenditures per Pupil	1981-82 Per Capita Income	1981-82 State/Local School Tax Efforts	1981-82 Education's Share of State/Local Expenditures	1981-82 Public School Students as Percent of Population	1981-82 Current Expenditures per Pupil
United States	100	100	100	100	100	100	100	100	100	100
Alabama	75	87	83	105	68	79	74	94	108	64
Alaska	114	165	87	119	183	145	177	74	116	193
Arizona	95	118	110	104	92	92	105	104	103	75
Arkansas	75	76	94	102	63	78	101	107	108	69
California	111	104	93	112	98	113	87	88	102	94
Colorado	102	118	104	106	90	111	98	114	105	96
Connecticut	119	102	110	98	124	124	89	107	88	120
Delaware	115	112	110	107	112	106	111	99	99	125
District of Columbia	130	78	72	86	132	121	73	61	80	139
Florida	97	78	104	89	91	99	83	101	82	89
Georgia	87	75	95	103	78	85	98	95	108	78
Hawaii	111	98	73	109	107	105	93	70	93	107
Idaho	84	95	98	114	75	81	110	104	122	74
Illinois	114	90	101	92	111	109	95	89	91	109
Indiana	97	102	123	103	86	90	110	117	105	89
Iowa	95	108	124	107	103	97	116	104	104	105
Kansas	99	94	105	99	89	105	102	105	95	104
Kentucky	80	76	96	99	69	80	93	90	103	76
Louisiana	79	114	97	103	91	92	101	95	101	97
Maine	89	110	92	110	84	81	114	105	110	86
Maryland	109	112	109	102	112	110	100	96	96	117
Massachusetts	109	95	95	96	101	109	103	95	97	125
Michigan	109	116	105	106	117	98	123	103	114	121
Minnesota	95	137	109	111	107	101	118	99	104	109
Mississippi	70	78	96	106	69	70	109	98	107	88
Missouri	95	90	105	94	84	92	89	110	92	84
Montana	89	104	103	111	93	88	134	122	106	101
Nebraska	97	73	108	101	74	98	102	111	101	97
Nevada	113	110	89	110	83	109	79	98	98	82
New Hampshire	94	90	95	95	86	97	89	103	99	83
New Jersey	116	100	112	90	132	118	107	111	93	141
New Mexico	79	108	107	115	78	89	141	113	116	95
New York	117	120	86	84	156	111	109	87	87	148
North Carolina	85	86	105	101	76	81	102	111	107	89
North Dakota	83	96	96	108	85	98	109	109	105	104
Ohio	101	92	105	102	88	96	93	109	101	97
Oklahoma	84	84	95	104	85	102	105	109	106	99
Oregon	95	116	105	99	102	95	125	107	95	108
Pennsylvania	99	109	107	91	110	99	105	105	94	119
Rhode Island	100	95	91	91	110	97	95	95	84	124
South Carolina	77	92	111	108	75	77	107	109	112	89
South Dakota	82	99	102	113	79	87	107	92	108	81
Tennessee	82	80	94	102	71	80	91	92	105	71
Texas	89	95	112	105	86	108	99	115	110	79
Utah	83	116	102	135	73	90	132	121	133	67
Vermont	92	157	86	110	125	86	116	95	104	90
Virginia	96	92	112	102	89	109	91	109	105	90
Washington	103	109	97	107	99	104	105	107	101	104
West Virginia	80	88	93	102	73	79	123	113	111	88
Wisconsin	95	112	97	97	108	97	107	105	95	116
Wyoming	98	110	96	117	87	111	114	112	114	125
United States average	*($10,498)	(3.1%)	(37.7%)	(20.9%)	*($2,082)	($11,051)	(4.4%)	(34.5%)	(16.1%)	($2,708)

*Expressed in constant 1982 dollars, using Consumer Price Index for income and Index of State and Local Governments Purchases for expenditures.

SOURCE: Per capita income from U.S. Department of Commerce, Bureau of Economic Analysis, *News*, bulletin, September 8, 1983. Share allocated to elementary and secondary education from U.S. Department of Commerce, *Compendium of Government Finances, 1972* and Census of Governments, *Governmental Finances, 1981-82*, 1983. Average daily attendance from National Education Association, *Estimates of School Statistics, 1973-74*, 1975, and revised unpublished data for 1981-82. Population from U.S. Department of Commerce, Bureau of the Census, *Current Population Reports*, various years. State/local school tax efforts calculated from State/local school revenues as reported by the National Education Association and other sources cited above. Expenditures per pupil from National Education Association, *Estimates of School Statistics, 1973-74*, 1975, copyrighted, and revised unpublished data for 1981-82.

Chart 1.15

Per Pupil Expenditures and Per Capita Income Indexed to National Average, by State: 1981-82



When indexed to the 1981-82 national average, many States with incomes 10 percent or more below average had an even lower index of per pupil expenditures. The majority of States with incomes 10 percent or more above average had an index of per pupil expenditures that exceeded their per capita income index number.

Table 1.16

Percentage Distribution of Federal, State, and Local Revenues for Public Elementary/Secondary Education: Selected Years, 1971-72 to 1981-82

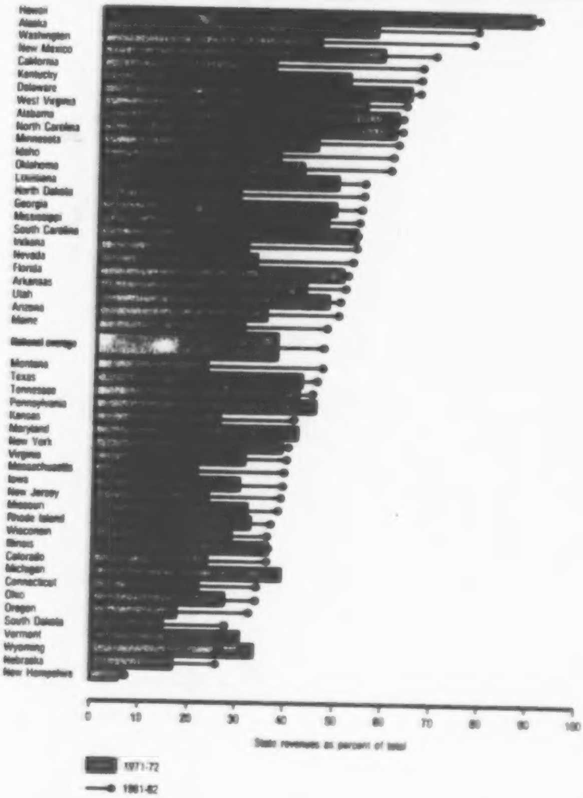
State	1971-72			1974-75			1979-80			1981-82		
	Federal	State	Local	Federal	State	Local	Federal	State	Local	Federal	State	Local
	Percentage Distribution											
United States	7.5	37.6	54.9	7.7	41.2	51.1	8.8	46.7	44.5	7.4	47.2	45.4
Alabama	17.8	61.1	21.1	17.6	58.7	23.7	12.2	66.9	20.9	14.6	62.0	23.4
Alaska	11.8	56.5	31.7	17.2	61.6	21.2	12.4	67.3	20.3	4.0	77.3	18.7
Arizona	8.2	35.1	56.7	9.4	42.2	48.4	10.5	39.4	50.1	8.7	50.1	41.2
Arkansas	15.5	43.0	41.5	16.2	45.6	38.2	13.6	47.8	38.6	12.7	51.3	36.0
California	6.5	35.3	58.2	9.3	39.1	51.6	8.4	70.4	21.2	8.6	66.2	25.2
Colorado	7.2	33.9	58.9	6.9	40.0	53.1	5.9	39.4	54.7	5.5	36.2	58.3
Connecticut	2.6	22.1	75.3	2.9	24.6	72.5	6.0	31.1	62.9	5.6	34.1	60.3
Delaware	7.1	63.6	29.3	8.1	67.1	24.8	12.8	63.6	23.6	10.5	65.6	23.9
District of Columbia	13.3	—	86.7	18.2	—	81.8	15.8	—	84.2	15.1	—	84.9
Florida	10.6	59.0	30.4	8.2	56.6	35.2	10.7	53.3	36.0	8.2	51.5	40.3
Georgia	12.9	48.6	38.5	11.9	52.3	35.8	11.5	56.4	32.1	9.4	54.1	36.5
Hawaii	8.4	88.7	2.9	9.0	85.1	5.9	12.5	85.2	2.3	9.9	89.7	0.4
Idaho	12.2	36.9	50.9	9.7	42.1	48.2	8.8	50.9	40.3	7.2	70.3	22.5
Illinois	8.6	34.4	57.0	5.4	40.1	54.5	11.4	36.7	51.9	8.1	36.5	55.4
Indiana	5.3	30.8	63.9	5.9	33.5	60.6	8.7	54.4	36.9	5.2	53.4	41.3
Iowa	3.6	36.3	60.1	5.6	41.1	53.3	6.6	41.5	51.9	5.5	38.4	56.1
Kansas	7.6	33.9	58.5	7.2	38.0	54.8	6.7	41.6	51.7	5.0	41.3	53.7
Kentucky	15.9	51.0	33.1	14.3	47.3	38.4	11.9	66.1	22.0	10.7	65.8	23.5
Louisiana	12.3	48.1	39.6	15.5	49.7	34.8	14.1	52.0	33.9	9.6	55.0	35.4
Maine	8.9	30.5	60.6	7.8	43.4	48.8	9.3	47.1	43.6	8.7	49.0	42.3
Maryland	6.9	42.1	51.0	6.6	44.5	48.9	8.0	40.0	52.0	6.7	40.5	52.8
Massachusetts	5.0	21.4	73.6	4.0	24.0	72.0	6.5	36.3	57.2	5.1	38.6	56.3
Michigan	3.3	39.1	57.6	3.4	45.2	51.4	7.1	40.7	52.2	7.6	35.3	57.1
Minnesota	4.3	44.7	51.0	4.3	53.5	42.2	5.7	53.1	41.2	4.7	61.5	33.8
Mississippi	27.0	47.2	25.8	22.5	51.1	26.4	23.4	51.6	25.0	18.5	54.8	26.7
Missouri	7.7	32.0	60.3	7.8	33.4	58.8	9.4	35.5	55.1	7.9	38.4	53.7
Montana	8.2	33.2	58.6	8.2	38.6	53.2	8.1	47.3	44.6	8.0	47.0	45.0
Nebraska	6.0	17.0	77.0	8.2	25.1	66.7	7.2	16.7	76.1	6.7	26.2	67.1
Nevada	6.8	22.7	70.5	5.5	33.7	60.8	8.2	56.1	35.7	7.6	52.6	39.8
New Hampshire	5.3	6.0	88.7	2.6	6.9	90.5	4.9	6.4	88.7	4.0	6.9	89.1
New Jersey	4.3	23.9	71.8	5.2	30.2	64.6	4.0	39.9	56.1	3.5	38.9	57.6
New Mexico	18.9	57.9	23.2	17.2	56.0	26.8	15.6	59.6	24.8	11.1	68.4	20.5
New York	5.3	38.9	55.8	4.6	38.2	57.2	4.9	39.3	55.8	3.7	40.1	56.1
North Carolina	15.4	60.7	23.9	13.3	65.3	21.4	15.0	61.4	23.6	15.4	61.9	22.7
North Dakota	11.8	30.0	58.2	8.4	40.4	51.2	7.2	43.1	49.7	6.6	54.6	38.8
Ohio	5.5	27.3	67.2	5.4	33.8	60.8	7.2	37.5	55.3	5.8	33.9	60.3
Oklahoma	10.2	41.9	47.9	11.2	45.6	43.2	10.8	54.4	34.8	8.0	60.1	32.0
Oregon	4.0	17.8	78.2	5.7	24.8	69.5	9.4	33.8	56.8	8.7	32.7	58.6
Pennsylvania	6.3	45.7	48.0	8.5	47.1	44.4	8.2	43.6	48.2	7.3	42.7	49.9
Rhode Island	8.3	32.7	59.0	8.5	34.3	57.2	5.8	38.7	55.5	4.9	36.8	58.3
South Carolina	17.4	53.4	29.2	14.4	56.7	28.9	14.4	55.2	30.4	13.4	53.6	33.0
South Dakota	12.4	14.9	72.7	14.7	12.3	73.0	13.5	20.3	66.2	9.4	28.2	62.4
Tennessee	13.2	42.0	44.8	10.5	50.1	39.4	12.9	44.6	42.5	12.5	45.0	42.5
Texas	10.3	42.7	47.0	10.6	41.7	47.7	10.3	46.8	42.9	8.1	46.0	45.9
Utah	8.6	47.9	43.5	8.0	49.8	42.2	6.9	47.5	45.6	6.1	50.2	43.7
Vermont	5.7	30.9	63.4	5.8	28.4	65.8	7.5	27.2	65.3	6.7	27.2	66.0
Virginia	11.0	31.4	57.6	9.9	29.9	60.2	9.2	39.9	50.9	7.7	40.0	52.3
Washington	7.6	44.7	47.7	7.8	48.4	43.8	8.4	69.3	22.3	5.4	76.4	18.2
West Virginia	13.0	54.6	32.4	10.9	48.9	40.2	8.7	55.1	36.2	9.6	62.5	27.9
Wisconsin	4.0	28.7	67.3	4.1	35.8	60.1	5.0	33.7	61.3	4.8	36.5	58.7
Wyoming	.5	33.5	66.0	6.9	32.9	60.2	5.9	26.8	67.3	3.0	26.4	70.6

—Not applicable.

SOURCE: National Education Association, *Estimates of School Statistics*, editions for 1973-74, 1976-77, 1981-82, copyrighted, and unpublished revised data for 1981-82.

Chart 1.16

State Share of Public Elementary/Secondary School Revenues



In all but five States, the State government provided a larger share of school revenues in 1981-82 than in 1971-72.

Table 1.17

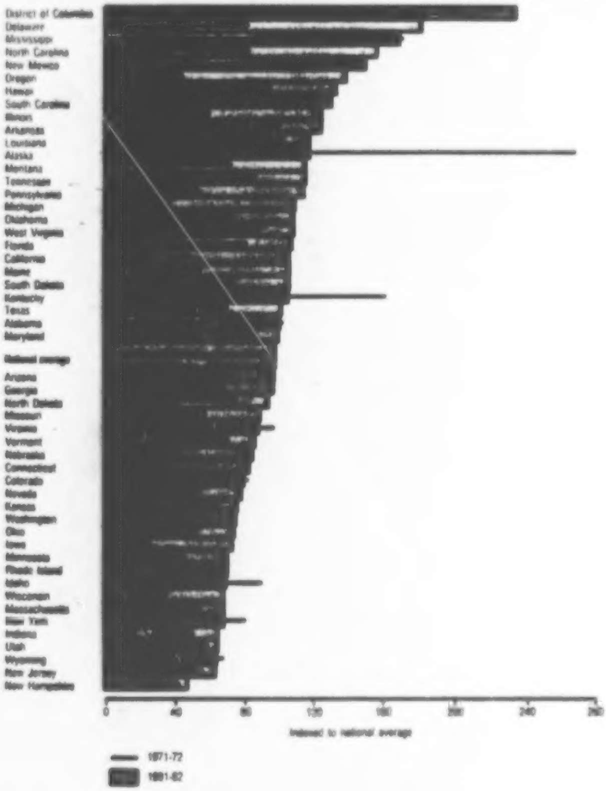
Federal Education Revenues per Pupil, in Current Dollars and Indexed to the National Average: 1971-72 and 1981-82

State	1971-72		1981-82	
	Dollars	Index	Dollars	Index
United States	$112	100	$234	100
Alabama	116	104	242	103
Alaska	281	251	281	120
Arizona	84	75	231	99
Arkansas	117	105	298	127
California	57	51	254	108
Colorado	93	83	190	81
Connecticut	46	41	197	84
Delaware	95	85	431	184
District of Columbia	239	213	580	248
Florida	94	84	258	110
Georgia	79	70	229	98
Hawaii	110	98	318	136
Idaho	102	91	164	70
Illinois	68	61	295	126
Indiana	57	51	153	65
Iowa	30	27	173	74
Kansas	73	65	180	77
Kentucky	183	163	253	108
Louisiana	117	104	280	120
Maine	64	57	253	108
Maryland	98	88	238	102
Massachusetts	61	55	182	78
Michigan	45	40	262	112
Minnesota	51	46	166	71
Mississippi	195	174	400	171
Missouri	65	58	213	91
Montana	83	74	278	119
Nebraska	49	44	202	86
Nevada	62	55	187	80
New Hampshire	47	42	111	47
New Jersey	62	55	147	63
New Mexico	146	130	357	153
New York	91	81	163	70
North Carolina	95	85	372	159
North Dakota	86	77	224	96
Ohio	60	54	175	75
Oklahoma	85	76	261	111
Oregon	52	47	332	142
Pennsylvania	62	55	273	117
Rhode Island	79	71	165	71
South Carolina	135	121	311	133
South Dakota	87	77	253	108
Tennessee	98	88	276	118
Texas	81	73	241	103
Utah	66	59	153	65
Vermont	79	71	203	87
Virginia	110	98	211	90
Washington	85	76	179	76
West Virginia	100	89	259	111
Wisconsin	39	35	162	69
Wyoming	75	67	151	64

SOURCE: National Education Association, *Estimates of School Statistics*, 1973-74 and 1982-83 editions, copyrighted.

Chart 1.17

Federal Education Revenues Per Pupil Indexed to National Average



All but 11 States received more Federal revenues per pupil relative to the national average in 1981-82 than in 1971-72.

Table 1.18

Trends in Expenditures for Public Elementary/Secondary Education, by Purpose: Selected Years, 1970-71 to 1979-80

Purpose of Expenditures	1970-71	1971-72	1973-74	1975-76	1979-80
			In Thousands of Current Dollars		
Total expenditures, all schools	[illegible]	[illegible]	[illegible]	$70,600,573	[illegible]
Current expenditures, all schools	[illegible]	42,213,000	50,477,045	62,087,754	87,361,727
Public elementary/secondary schools	[illegible]	41,817,782	50,004,030	62,054,165	86,004,142
Administration	1,759,107	1,875,064	2,275,726	2,666,966	4,263,757
Instruction	26,234,200	28,140,285	32,066,082	39,867,464	53,257,937
Plant operation and maintenance	3,060,355	4,324,771	5,291,573	6,675,460	9,744,785
Fixed charges	3,657,389	4,086,464	5,626,862	7,321,317	11,790,934
Other school services	3,065,837	3,372,750	4,222,005	5,060,526	7,623,729
Other programs[1]	973,400	396,310	463,357	563,640	697,585
Capital outlay	4,501,884	4,458,040	4,978,979	6,146,425	6,506,167
Interest on school debt	1,317,049	1,376,226	1,513,534	1,846,304	1,873,666
			In Thousands of Constant (1981-82) Dollars[2]		
Total expenditures, all schools	$107,263,000	$107,163,062	$107,049,001	$113,886,912	$111,726,673
Current expenditures, all schools	93,513,363	94,138,473	95,373,871	100,924,044	101,970,152
Public elementary/secondary schools	91,218,366	93,294,617	94,617,371	100,021,600	101,274,362
Administration	4,221,837	4,182,430	4,299,603	4,538,653	4,964,231
Instruction	61,679,671	62,771,572	61,611,452	63,676,314	62,087,455
Plant operation and maintenance	9,344,773	9,644,370	9,999,995	10,760,941	11,345,714
Fixed charges	8,620,113	9,126,164	10,601,130	11,892,903	13,731,588
Other school services	7,139,646	7,821,424	7,977,160	8,094,247	9,225,404
Other programs[1]	2,297,095	901,573	856,296	902,465	695,780
Capital outlay	10,740,705	9,940,581	9,407,376	9,958,087	7,575,039
Interest on school debt	3,106,809	3,073,886	2,859,782	2,976,361	2,181,480
			Percentage Distribution		
Total expenditures, all schools	100.0	100.0	100.0	100.0	100.0
Current expenditures, all schools	87.1	87.9	88.8	88.7	91.3
Public elementary/secondary schools	85.0	87.0	87.8	87.9	90.6
Administration	3.9	3.9	4.0	4.0	4.4
Instruction	57.6	58.6	57.2	56.2	55.5
Plant operation and maintenance	8.7	9.0	9.3	9.5	10.2
Fixed charges	8.0	8.5	9.9	10.4	12.3
Other school services	6.7	7.0	7.4	7.9	8.3
Other Programs[1]	2.1	.8	.8	.7	.6
Capital outlay	10.0	9.3	8.7	8.7	6.8
Interest on school debt	2.9	2.9	2.7	2.6	2.0

[1] Other programs include summer schools and community services. In 1970-71, adult education and community colleges were also included.

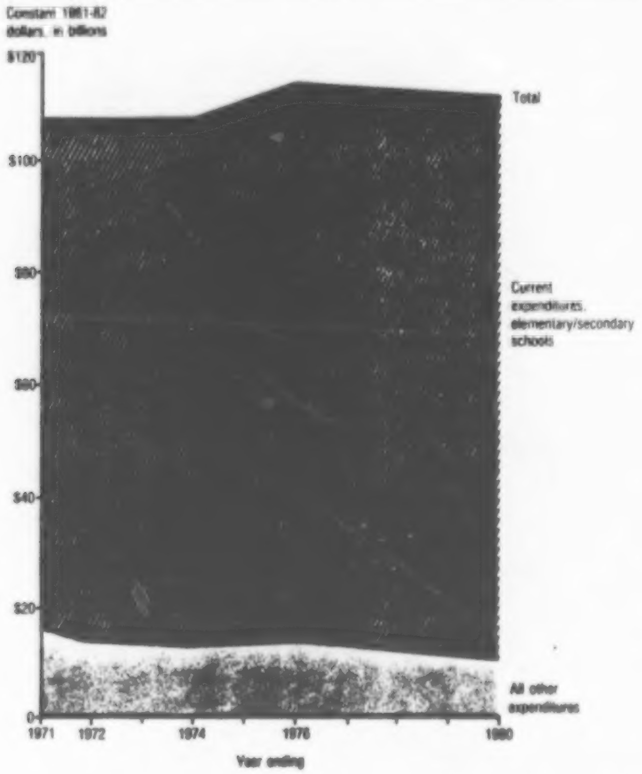
[2] Adjusted for inflation, using the Index of State and Local Governments Purchases.

NOTE: Details may not add to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Expenditures and Revenues for Public Elementary and Secondary Education, 1970-71*, 1973; *Statistics of State School Systems*, various years; and Common Core of Data Survey, unpublished tabulations (June 1983).

Chart 1.18

Expenditures for Public Elementary/Secondary Education



While current expenditures for public elementary/secondary education appeared to have doubled between 1970-71 and 1979-80, most of the rise was attributable to inflation. When adjusted for inflation, expenditures for capital outlay and interest on the school debt decreased substantially over the period.

Table 1.19

Trends in Current Expenditures for Salaries of Classroom Teachers in Public Elementary/Secondary Schools: 1970-71 to 1981-82

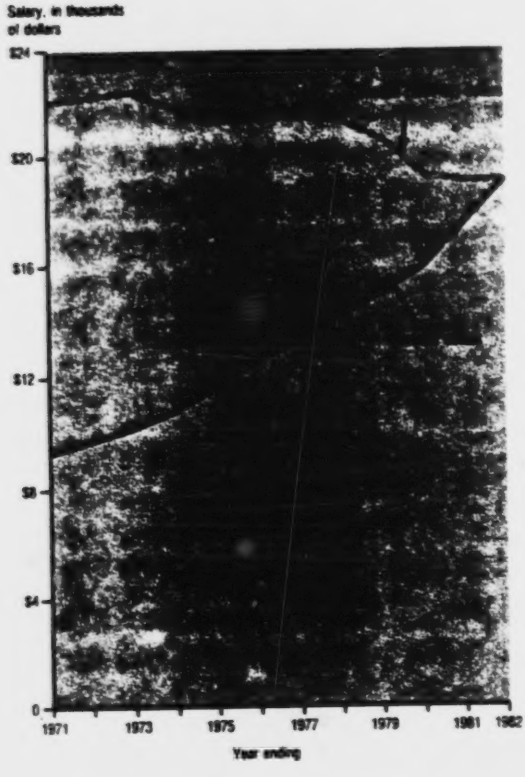
Year	Number of Classroom Teachers, in Thousands	Salaries of Classroom Teachers			
		Average Annual Salary		Total, in Billions	
		Current Dollars	Constant (1981-82) Dollars*	Current Dollars	Constant (1981-82) Dollars*
1970-71	2,055	$9,269	$21,985	$19.0	$45.0
1971-72	2,063	9,705	22,187	20.0	45.7
1972-73	2,103	10,176	22,372	21.4	47.0
1973-74	2,133	10,778	21,770	23.0	46.4
1974-75	2,165	11,690	21,242	25.3	46.0
1975-76	2,196	12,591	21,303	27.6	46.8
1976-77	2,186	13,352	21,414	29.2	46.8
1977-78	2,209	14,207	21,360	31.4	47.2
1978-79	2,207	15,032	20,637	33.1	45.5
1979-80	2,183	15,951	19,330	34.8	42.2
1980-81	2,162	17,601	19,127	38.1	41.4
1981-82	2,117	19,157	19,157	40.6	40.6

*Adjusted for inflation, using the Consumer Price Index.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics to 1990-91*, 1982, and Common Core of Data, unpublished tabulations (November 1983); National Education Association, *Estimates of School Statistics, 1982-83*, 1983, copyrighted, and unpublished tabulations.

Chart 1.19

Average Annual Salary of Classroom Teachers in Public Elementary/Secondary Schools



When adjusted for inflation, the average salary of public school teachers generally declined throughout the 1970's.

Table 1.20

Average Percentage of Correct Responses by 9-, 13-, and 17-Year-Olds on All Mathematics Exercises, by Selected Student and School Characteristics: 1981-82 and Change from 1977-78

	9-Year-Olds		13-Year-Olds		17-Year-Olds	
Characteristic	Average Percent Correct, 1982	Change from 1978 to 1982, in Percentage Points	Average Percent Correct, 1982	Change from 1978 to 1982, in Percentage Points	Average Percent Correct, 1982	Change from 1978 to 1982, in Percentage Points
National average	56.4	1.0	60.5	*3.8	60.4	−0.1
Racial/ethnic group:						
White	58.8	.7	63.1	*3.2	63.2	−.1
Black	45.2	2.1	48.2	*6.5	43.7	1.3
Hispanic	47.7	1.1	51.9	*6.5	48.5	.9
Achievement quartile:[1]						
Low	34.5	1.9	38.8	*5.8	37.4	.5
Mid-low	51.8	.9	55.5	*4.5	54.8	−.2
Mid-high	63.0	.4	66.5	*3.3	67.1	−.3
High	76.2	.7	80.1	*1.8	82.3	−.8
Percent white in school:						
0 to 50 percent	46.8	2.4	50.6	*6.1	47.5	*4.0
60 to 100 percent	58.8	1.0	62.4	*2.8	62.3	.1
Type of community:						
Rural	52.7	1.5	56.3	*3.7	58.0	−1.0
Urban disadvantaged[2]	45.5	1.1	49.3	*5.8	45.8	1.9
Urban advantaged[3]	68.3	1.3	70.7	*5.6	70.0	−.3

*Indicates statistically significant change in performance between assessments at the .05 level.

[1] Based on mathematics assessment scores, students nationwide were partitioned into four achievement groups of equal size, each group representing 25 percent of the students.

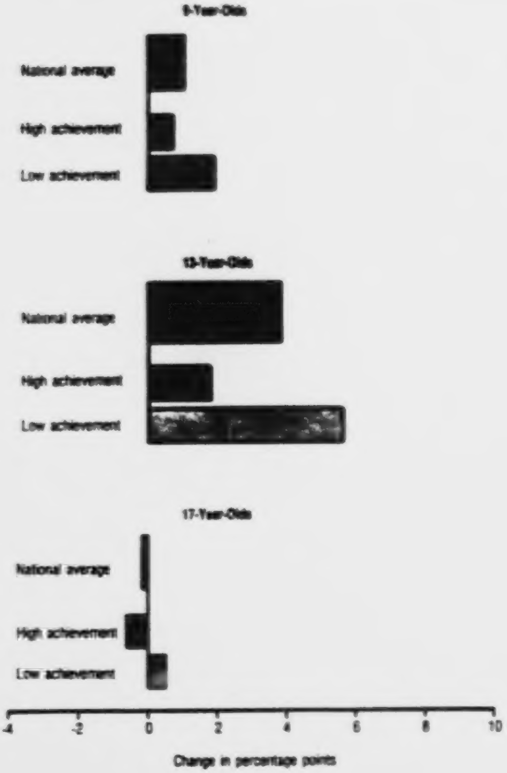
[2] Cities having a population greater than 200,000 where a high proportion of the residents are on welfare or are not regularly employed.

[3] Cities having a population greater than 200,000 where a high proportion of the residents are in professional or managerial positions.

SOURCE: Education Commission of the States, National Assessment of Educational Progress, *The Third National Mathematics Assessment: Results, Trends and Issues*, 1983.

Chart 1.20

Change From 1978 to 1982 in Mathematics Performance of 9-, 13-, and 17-Year-Olds on All Exercises



All groups of 13-year-old students improved in overall mathematics performance, while 9- and 17-year-olds showed few significant changes.

Table 1.21

Average Mathematics Performance of 9-, 13-, and 17-Year Olds on Exercises Assessing Mathematical Knowledge, Skills, Understanding, and Applications, by Race/Ethnicity, Achievement Quartile, and Type of Community: 1981-82 and Change from 1977-78

Characteristic	Knowledge		Skills		Understanding		Applications	
	1982	Change from 1978 to 1982, in Percentage Points	1982	Change from 1978 to 1982, in Percentage Points	1982	Change from 1978 to 1982, in Percentage Points	1982	Change from 1978 to 1982, in Percentage Points
	Average Percent Correct							
9-year-olds, national average	66.3	1.4	50.6	0.8	41.2	−0.4	38.8	0.6
Race/ethnic group								
White	70.8	1.2	53.1	.6	43.4	−.8	42.4	.6
Black	57.8	*3.5	38.7	1.6	31.4	.9	27.0	−.6
Hispanic	58.7	.0	43.8	2.5	32.4	−.2	30.5	.6
Achievement quartile[1]								
Low	44.5	*2.8	30.1	3.3	22.1	.5	18.5	1.8
Mid-low	65.7	1.6	45.6	.7	33.5	−.9	31.5	.5
Mid-high	76.6	1.2	56.3	−.1	45.0	−1.8	45.4	.7
High	86.4	.8	70.6	.7	64.1	.4	63.1	.8
Type of community								
Rural	65.1	2.3	46.5	1.0	35.6	−1.5	37.3	3.2
Urban disadvantaged[2]	56.6	2.1	40.1	1.4	31.7	−1.3	29.6	−1.2
Urban advantaged[3]	77.5	1.9	60.1	.8	53.0	.7	50.0	.9
13-year-olds, national average	73.8	*4.5	57.6	*4.0	60.5	*3.8	45.6	*2.8
Race/ethnic group								
White	76.1	*3.9	60.4	*3.4	62.6	*3.6	47.9	*1.6
Black	62.8	*8.3	44.0	*6.7	48.4	*5.9	34.6	*4.4
Hispanic	65.3	*6.3	49.2	*7.2	49.7	*5.8	30.8	*6.0
Achievement quartile[1]								
Low	58.2	*7.8	34.6	*5.2	37.7	*6.1	27.8	*3.8
Mid-low	71.4	*5.6	51.7	*4.6	54.8	*4.7	38.6	*2.3
Mid-high	79.3	*3.8	64.3	*3.8	67.4	*3.2	50.1	1.5
High	88.4	*1.8	78.7	*2.2	82.3	*2.8	66.0	1.0
Type of community								
Rural	70.6	*5.0	53.0	*4.1	54.5	1.9	42.9	2.3
Urban disadvantaged[2]	63.9	*6.8	45.6	*6.3	47.7	*5.1	35.8	3.2
Urban advantaged[3]	81.1	*4.0	66.6	*6.9	72.2	*6.5	54.7	*3.6
17-year-olds, national average	74.9	.2	60.0	.3	61.5	−.3	42.4	−1.1
Race/ethnic group								
White	77.3	.9	63.0	.3	64.7	−.1	45.5	−1.0
Black	62.6	3.0	44.2	1.8	44.8	−.2	28.0	−.2
Hispanic	66.1	2.0	48.4	.5	49.7	.8	31.4	.4
Achievement quartile[1]								
Low	55.7	1.8	36.2	.8	36.7	−.3	21.5	−.4
Mid-low	71.7	−.3	54.1	.4	55.5	.1	34.0	−1.3
Mid-high	81.3	−.2	67.2	.3	69.3	−.4	46.7	−1.5
High	90.9	−.3	82.3	−.5	84.5	−.8	67.2	−1.6
Type of community								
Rural	72.2	−1.4	57.2	.4	57.1	−.2	38.5	−2.7
Urban disadvantaged[2]	64.7	*3.8	46.4	1.8	47.8	−.3	30.1	1.8
Urban advantaged[3]	82.5	.5	68.7	−.1	72.3	−.3	52.8	−1.4

*Indicates statistically significant change in performance between assessments at the .05 level.

[1] Based on mathematics assessment scores, students nationwide were partitioned into four achievement groups of equal size, each group representing 25 percent of the students.

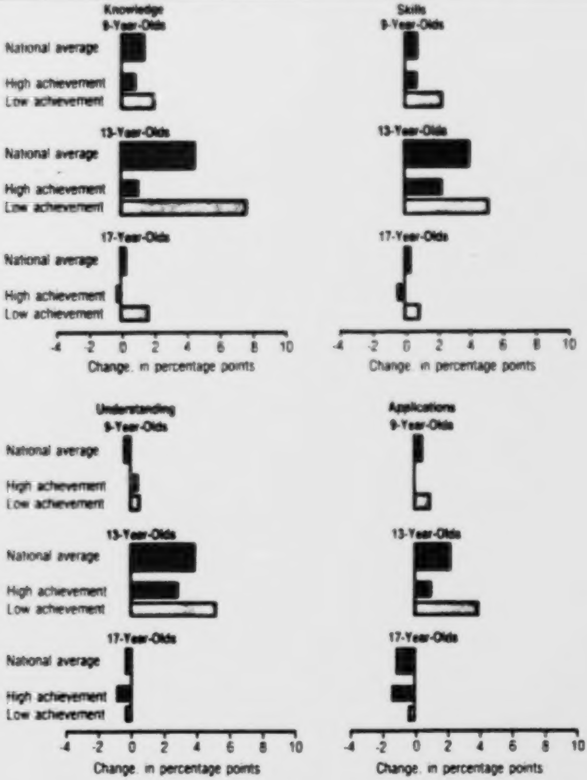
[2] Cities having a population greater than 200,000 where a high proportion of the residents are on welfare or are not regularly employed.

[3] Cities having a population greater than 200,000 where a high proportion of the residents are in professional or managerial positions.

SOURCE: Education Commission of the States, National Assessment of Educational Progress, *The Third National Mathematics Assessment: Results, Trends and Issues,* 1983.

Chart 1.21

Change from 1978 to 1982 in Mathematics Performance of 9-, 13-, and 17-Year-Olds on Exercises of Knowledge, Skills, Understanding, and Application



Thirteen-year-old students in the lowest achievement quartile gained significantly at each learning level of mathematics performance between 1978 and 1982. Other age and performance groups showed minimal changes across all learning levels.

Table 1.22

Average Science Performance of 9-, 13-, and 17-Year-Olds in Selected Assessment Areas, by Sex, Race, and Region: 1981-82 and Change from 1976-77

Age Group, Sex, Race, and Region	Assessment Areas: Content, 1982	Content, Change from 1977 to 1982, in Percentage Points	Inquiry, 1982	Inquiry, Change from 1977 to 1982, in Percentage Points	Science, Technology, and Society, 1982	Science, Technology, and Society, Change from 1977 to 1982, in Percentage Points
			Average Percent Correct			
9-year-olds, national average	—	—	52.6	-1.0	59.9	*2.8
Sex:						
Male	—	—	52.8	-1.1	60.5	*3.1
Female	—	—	52.5	-.9	59.4	*2.6
Race:						
White male	—	—	56.9	-1.3	62.7	*3.0
Black male	—	—	40.8	3.4	50.7	4.4
White female	—	—	56.3	-1.7	61.3	2.2
Black female	—	—	41.4	1.8	51.7	4.3
Region:						
Northeast	—	—	54.9	-1.2	58.8	2.1
Southeast	—	—	50.5	2.0	57.2	2.6
Central	—	—	54.6	-1.5	61.4	3.8
West	—	—	50.8	-2.0	60.6	2.7
13-year-olds, national average	52.4	-.4	58.0	-.8	57.4	.6
Sex:						
Male	54.7	.3	58.5	-.4	59.5	.9
Female	50.2	-1.0	57.6	-.8	56.3	.3
Race:						
White male	56.8	-.2	60.4	-.8	61.5	.7
Black male	44.6	2.4	48.8	.6	50.1	1.5
White female	52.4	-1.2	58.7	-1.1	57.4	.4
Black female	40.6	-.8	49.3	.1	46.8	-.8
Region:						
Northeast	53.3	-1.7	58.9	-2.0	57.6	-.8
Southeast	49.0	-.6	54.4	-1.3	55.2	.1
Central	54.1	-.3	58.9	-.5	58.0	1.3
West	52.5	.7	57.4	1.7	57.1	1.4
17-year-olds, national average	59.7	*-2.0	69.6	*-2.8	67.0	-.5
Sex:						
Male	62.7	*-2.2	70.2	*-2.6	68.6	-1.4
Female	56.9	*-1.7	68.1	*-2.4	65.4	.3
Race:						
White male	65.6	-1.7	72.8	*-2.8	71.2	-1.2
Black male	47.[illegible]	-1.8	58.1	-.1	55.8	.3
White female	59.3	-1.6	71.6	*-2.5	67.8	.2
Black female	44.4	-1.3	56.7	-1.8	54.1	2.8
Region:						
Northeast	60.1	*-4.1	71.1	*-3.6	67.0	-1.6
Southeast	57.3	-.1	66.7	-1.9	64.6	.7
Central	61.9	-.9	71.4	-2.1	68.6	-.6
West	58.7	-2.4	68.2	-2.5	67.0	.1

—Not applicable; 9-year-olds were not tested.

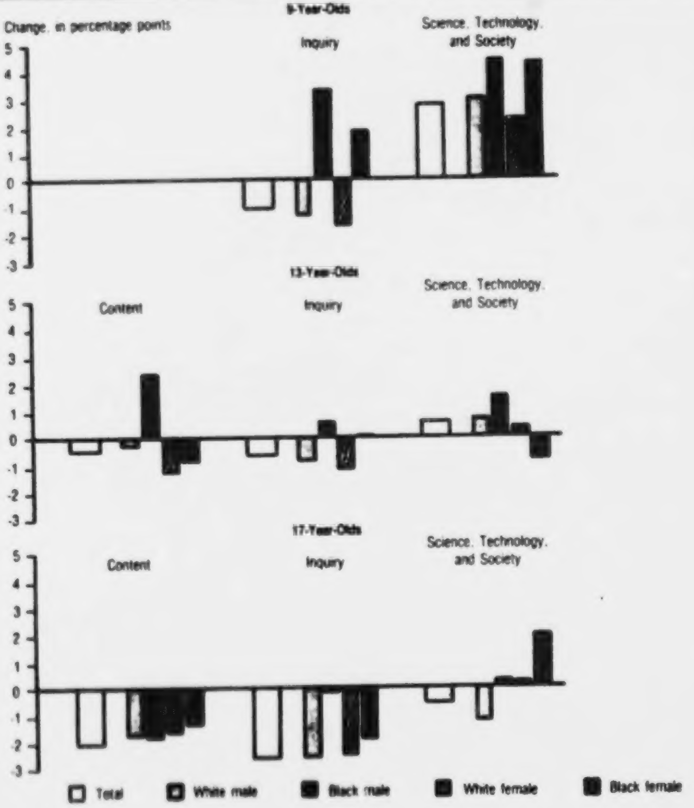
*Indicates statistical significance at the .05 level.

NOTE: Results of the Science Assessment Research Project study are shown for three science assessment areas. Comprehensive definitions of these areas may be found in the Data Sources in the Appendix.

SOURCE: University of Minnesota, Minnesota Research and Evaluation Center, *Images of Science*, 1983, copyrighted.

Chart 1.22

Change from 1977 to 1982 in Average Science Performance of 9-, 13-, and 17-Year-Olds



Students' performance in science between 1977 and 1982 changed minimally or was mixed, depending on the knowledge area and age group assessed.

Table 1.23

Trends in Number of Public and Private High School Graduates and as Percent of 18-Year-Old Population: 1970-71 to 1992-93

	Numbers in Thousands					
			Sex		Control	
Year	Total High School Graduates	As Percent of 18-Year-Old Population	Male	Female	Public	Private (Estimated)
1970-71	**2,937**	**75.7**	1,454	1,483	2,637	300
1971-72	**3,001**	**75.5**	1,487	1,514	2,699	302
1972-73	**3,036**	**74.9**	1,500	1,536	2,730	306
1973-74	**3,074**	**74.9**	1,512	1,562	2,763	310
1974-75	**3,133**	**73.6**	1,542	1,591	2,823	310
1975-76	**3,148**	**73.8**	1,569	1,579	2,837	311
1976-77	**3,154**	**74.1**	1,547	1,607	2,840	315
1977-78	**3,127**	**73.6**	1,531	1,596	2,825	302
1978-79	**3,101**	**71.8**	1,516	1,585	2,801	300
1979-80	**3,043**	**71.5**	1,491	1,552	2,748	295
1980-81	**3,020**	**71.3**	1,483	1,537	2,725	295
1981-82	**[1]3,001**	**71.7**	1,474	1,527	2,711	290
			Projected[2]			
1982-83	**2,916**	**72.6**	1,451	1,465	2,626	290
1983-84	**2,741**	**72.6**	1,366	1,375	2,469	272
1984-85	**2,656**	**72.6**	1,321	1,335	2,393	263
1985-86	**2,595**	**72.6**	1,292	1,303	2,338	257
1986-87	**2,663**	**72.6**	1,326	1,337	2,399	264
1987-88	**2,739**	**72.6**	1,366	1,373	2,467	272
1988-89	**2,742**	**72.6**	1,368	1,374	2,450	292
1989-90	**2,491**	**72.6**	1,242	1,249	2,244	247
1990-91	**2,408**	**72.6**	1,200	1,208	2,169	239
1991-92	**2,323**	**72.6**	1,159	1,164	2,093	230
1992-93	**2,378**	**72.6**	1,187	1,191	2,142	236

[1] Preliminary

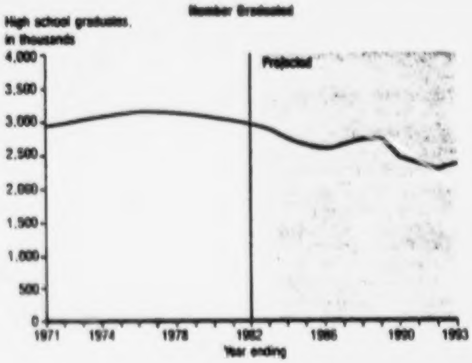
[2] For methodological details, see *Projections of Education Statistics to 1992-93*, forthcoming.

NOTE: Details may not add to totals because of rounding.

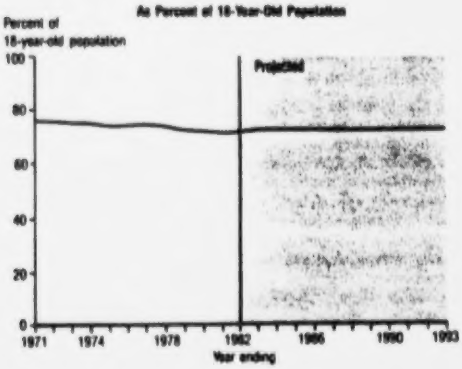
SOURCE: U.S. Department of Education, National Center for Education Statistics, *Statistics of Public Elementary and Secondary Day Schools*, various years; *Statistics of Nonpublic Elementary and Secondary Schools*, various years; *Public High School Graduates, 1980-81*, bulletin, 1983; and *Projections of Education Statistics to 1992-93*, forthcoming.

Chart 1.23

High School Graduates



Number Graduated



As Percent of 18-Year-Old Population

With little change projected in the high school graduation rate, schools are expected to graduate fewer students as the size of the high school age group decreases.

The Condition of Education 1984 Edition

National Center for Education Statistics

"The purpose of the Center shall be to collect and disseminate statistics and other data related to education in the United States and in other nations. The Center shall . . . collect, collate, and from time to time, report full and complete statistics on the conditions of education in the United States; conduct and publish reports on specialized analyses of the meaning and significance of such statistics; . . . and review and report on education activities in foreign countries."—Section 406 (b) of the General Education Provisions Act, as amended (20 U.S.C. 1211e-1).

Statistical Report
National Center for Education Statistics

Edited by Valena White Plisko

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U.S. Department of Education
T.H. Bell, Secretary

Office of Educational Research and Improvement
Donald J. Senese, Assistant Secretary

National Center for Education Statistics
Marie D. Eldridge, Administrator

Chapter 5
Secondary Education: Student Flows, Course Participation, and State Requirements

Given the interest in the Nation's high schools generated by the National Commission on Excellence in Education (NCEE) report and recent others, this chapter highlights data on secondary education—the transition from high school, coursework participation, and State graduation requirements. The section on student flows begins the chapter by presenting information on recent high school dropouts and postsecondary plans of high school seniors. While it shows that graduating from high school is the norm, it presents the various reasons given by dropouts for not graduating. A further section on coursework provides data taken from actual high school transcripts on student participation in basic subjects. These data show the extent to which 1982 high school graduates fulfilled the curriculum requirements recommended by the NCEE. The increased use of computers in schools is also discussed. The chapter concludes with State-by-State comparisons of changing high school graduation requirements, the use of minimum-competency testing, and requirements by State universities for college admission.

Student Flows

Dropping Out

High school graduation marks an important transition point in the lives of American youth and provides a measure of performance in secondary education. For many, high school graduation is followed by enrollment in higher education or a postsecondary vocational/trade school. For others, high school graduation represents the end of formal education as they enter the work force full-time and assume adult responsibilities. For some students, however, this formal transition point is not reached, dropping out as they do before graduation.

The High School and Beyond Study provides a look at the progression of students from the sophomore year through the senior year of high school and into adult status. Almost 14 percent of 1980 high school sophomores left high school without a diploma sometime after the spring of their sophomore year (entry 5.1). Generally, male sophomores were more likely to drop out than females, 15 percent as compared with 13 percent. The tendency for more males than females to drop out was consistent within most subgroups except Hispanics and American Indians/Alaskan Natives, those in the general high school program, and the various self-reported grade groups. When the sophomores were grouped according to their average grades, males had comparable or lower dropout rates than females. This suggests that higher dropout rates for males are associated with their earning generally lower grades than females. Among the racial/ethnic groups, American Indians/Alaskan Natives showed the highest dropout rates, more than 29 percent. Hispanics and blacks (18 percent and 17 percent, respectively) had higher dropout rates than whites (12 percent), and Asian Americans (3 percent). Higher dropout rates were also associated with low socioeconomic status, poor academic performance, and participation in non-academic programs.

Reasons for Dropping Out

Data from the first follow-up survey of High School and Beyond are useful in suggesting some factors that may prompt students to leave school before graduation. In the first follow-up survey, students who dropped out of school after the spring of their sophomore year were asked in retrospect to give their reasons. White males most frequently indicated they did not like school, while minority males most often indicated poor grades as the reason, 46 percent and 31 percent, respectively (entry 5.2). White females indicated marriage and dislike for school about evenly, 36 percent and 34 percent, while minority females cited poor grades and pregnancy, 30 percent and 29 percent, respectively.

Postsecondary Education Plans

The great preponderance of high school students do graduate, and most plan further education. A comparison of the high school senior classes of 1972 and 1980 shows some differences in the educational expectations of these cohorts. For example, between 1972 and 1980, those few seniors not expecting to graduate and those not planning to continue their education increased proportionally among males from 16 percent to 21 percent, but decreased among females from 22 percent to 18 percent (entry 5.3).[1] And while the percentage of high school seniors expecting to attain a 4-year degree decreased by more than 10 percentage points for males and females, the drop was offset by an increase in seniors expecting to attend graduate or professional school. The proportions expecting to do post-baccalaureate work increased from 16 percent to 21 percent for males and more than doubled for females from 9 percent to 20 percent.

Postsecondary Education Participation

An examination of actual postsecondary education participation rates substantiates the rise in female expectations. In 1972, 53 percent of females participated in some type of postsecondary education in the fall following high school graduation. By 1980, this percentage had risen to 56 percent (entry 5.4). This increase was consistent for females enrolled in both 4- and 2-year institutions; the rates at which females enrolled increased from 29 percent to 32 percent in 4-year institutions and from 15 percent to 19 percent in 2-year institutions.

Postsecondary participation rates remained generally stable across racial/ethnic, performance, and socioeconomic subgroups except for decreases among males and Hispanics. Overall entry rates for whites and blacks showed no change between 1972 and 1980, remaining at 55 percent and 47 percent, respectively. No significant differences were evident between 1972 and 1980 for the various performance groups, although high performers continued to display the highest rate of postsecondary school enrollment, 81 percent in 1980. Similarly, students with high socioeconomic backgrounds enrolled more frequently than students with middle or low socioeconomic status, 77 percent compared with 53 percent and 35 percent, respectively. These rates were not significantly different from those in 1972.

The decline in male postsecondary participation was confined to those in the high socioeconomic status (SES) group. Their participation directly following high school decreased by some 5 percentage points at 4-year institutions. High SES blacks also showed a decrease in participation in 4-year institutions. Hispanic participation rates appeared to have declined in 2-year and noncollegiate postsecondary schools.

Course Participation

Overall Coursework of Graduates

The high school transcripts of 1982 graduates show the average credit earned in selected subjects from freshman through senior year. Credit is expressed in Carnegie units, a unit being equivalent to completion of a 1-year course.

An examination of units earned shows that graduates of Catholic schools averaged more credits than graduates of public or non-Catholic private schools (entry 5.5). In all, Catholic school students earned about 23.8 units compared to 21.6 units by public school students and 21.3 units by other private school students.

Graduates in the academic program and the high performance group, and those with higher postsecondary education aspirations, took more mathematics and science courses than other graduates. Differences in coursework participation were particularly evident in science, where students in the high performance group took almost twice as much science as students in the low performance group, 2.9 units compared with 1.6. Students in academic programs took more science than students in general and vocational programs, 2.8 units vs. 1.9 and 1.6 units, respectively. Similar differences in science coursetaking were apparent between the lowest and highest educational aspiration groups.

Coursework Recommendations

In *A Nation at Risk*, the National Commission on Excellence in Education advocated stronger State and local high school graduation requirements than existed in 1983. Specifically, it recommended that students seeking a diploma be required to take 4 years of English, 3 years of mathematics, 3 years of science, 3 years of social studies, and one-half year of computer science. Additionally, the Commission urged that college-bound students be required to take 2 years of foreign language. In order to evaluate the degree to which high school graduates met these requirements, transcripts of 1982 high school graduates were analyzed as part of the High School and Beyond Study. According to the transcripts, fewer than 2 percent of high school graduates met the full set of curricular recommendations, including the foreign language credit, set forth by the Commission (entry 5.6). Even with the foreign language recommendation omitted, fewer than 3 percent of all graduates satisfied the Commission's standard for the non-college-bound. Excluding the computer science recommendation as well would raise this proportion to 13 percent. An analysis of individual subject areas shows that the social studies recommendation was met by the largest percentage of all graduates (65 percent) and the computer science recommendation by the smallest percentage (13 percent).

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[1] As shown in the table, data are also available for 1982 high school seniors, but the inclusion of a "don't know" choice in 1982 reduces comparability with the earlier years.

The type, size, and location of the school that graduates had attended were also examined in relation to the percentages fulfilling the recommendations. The type of high school—that is, whether it spanned the 9th through 12th grades or was a part of a combined elementary/secondary school—appeared to be unassociated with the overall percentage of graduates who met the Commission's recommendations. Yet, when school size was examined, graduates of schools with enrollments between 600 and 1,800 were more likely to have met the full set of recommendations for both the college-bound and non-college-bound than those who attended schools with smaller or larger enrollments. Differences by school size were, however, less evident in coursetaking in individual subject areas. Finally, school location showed some association with meeting the recommendations. High school graduates of 1982 in the Middle Atlantic region, for example, were the most likely to satisfy the various sets of curricular recommendations. So, too, were graduates from high schools in suburban areas, if only slightly more than graduates in other areas.

Differences were also apparent among students with varying characteristics. Smaller percentages of graduates meeting the Commission's recommendations were associated with lower educational aspirations (entry 5.7). This was most evident for students expecting to discontinue their formal education after graduation and for those planning to take some postsecondary education, but less than 4 years of college. Graduates expecting to attend 4 or more years of college were most likely to satisfy the curricular recommendations, although fewer than 4 percent met them all. Except for computer science, each subject area recommendation was met by at least half of the 1982 high school graduates aspiring to earn a college degree.

Academic Basics From Freshman Through Senior Year

Further analysis of student transcripts reveals that 1982 high school graduates took less coursework in academic basics (English, mathematics, science, and social studies) in their senior year than in earlier grades (entry 5.8). Although students, on the average, earned over 5 Carnegie credits each year, the credits in these academic subjects declined from 3.6 units in the 9th grade to 2.6 units in the 12th grade. This decline was typical for all students, regardless of race/ethnicity, socioeconomic status, or other student or school characteristic. Substantial differences were evident, however, among various groups in the number of units taken per year in these academic subjects. For example, whites generally earned more credits in academic basics than blacks and Hispanics. Likewise, students from a high socioeconomic background, those in academic programs, and those in Catholic schools earned more basic academic credits than students in other categories.

The decline in the total number of credits earned at successive grade levels was also evident for several selected subject matter areas, particularly mathematics and science. The average credit earned for mathematics was 0.9 unit in the 9th grade, but declined to only 0.4 unit in the 12th grade (entry 5.9). Similarly, the average credit earned for science was 0.7 unit in the 9th grade but only 0.3 unit in the 12th grade. In contrast, the average number of Carnegie units earned for English remained about the same over the 4 years.

Microcomputer Coursework

The slight increase in the average credit earned in computer science may be due to the increased availability of microcomputers in schools. The use of microcomputers rises from elementary through secondary levels, according to figures released recently by Quality Education Data, Incorporated (QED). A far greater percentage of high schools have micros than do elementary schools (entry 5.10). The use of micros in elementary schools took a great jump between 1982 and 1983. Elementary schools had more micros in 1983 than did junior high schools in 1982, while the use of microcomputers doubled at the junior high level and increased by 50 percent at the senior high level.

A survey conducted by Johns Hopkins University also provides information on the amount of time the average user spends on the computer per week. At the secondary level, a typical student learning programming used the computer 55 minutes during the week compared to 17 minutes used per week for students doing drills or remedial work. Microcomputers were also frequently used in secondary schools for word or data processing. The typical secondary school micro-user spent 30 minutes on a computer per week for editing and writing, or in connection with a science or electronics laboratory. While this was half the amount of time a programming student got, it was twice that given to students using the equipment for drills and practice.

State Requirements

Graduation Requirements

In 1980, 39 States and the District of Columbia required a designated number of Carnegie units for high school graduation, according to data released by the National Association of Secondary School Principals. In a telephone follow-up, NCES found that between 1980 and 1982, 22 States and the District of Columbia approved or proposed new high school graduation requirements (entry 5.11).[2] A few States proposed State-level requirements where there were none, and several others added to existing requirements. Some States that already required a minimum of 20 units did not enact any changes. Colorado approved a total of 18 units as necessary for high school graduation in 1982-83 where no State-level requirements had existed before. Indiana approved 3 additional units, effective in 1982-83, and Louisiana and North Carolina each approved 2 additional units. Eight States approved additional units effective sometime after 1982-83, while 13 States were considering changes or further revisions in requirements from the 1980 base.

A number of States have initiated changes in mathematics and science curriculum requirements for high school graduation since 1980. Alabama, the District of Columbia, and Idaho each approved 1 additional unit of mathematics for high school graduation, to become effective after 1983, while changes or revisions in mathematics requirements effective after 1983 were under consideration in 11 other States (entry 5.12). Both the District of Columbia and Oklahoma approved 1 additional unit in science as necessary for graduation from high school. Science requirements that would apply to graduates after 1983 were under study in nine other States.

Minimum-Competency Testing

In an effort to improve the quality of education in public schools, many States have adopted provisions requiring minimum-competency testing of students. By 1983, 40 States required such testing to insure students meet a designated level of proficiency as determined by State or local authorities, or both (entry 5.13). Of those States that reported the government level setting the standards, 21 set them at the State level, 10 at the local level, and 7 at both levels. Twenty-five States tested students below the 5th grade level, and nearly all 40 States reported testing above the 8th grade. Five States expected to use competency testing for grade promotion. At the same time, nearly half of the States planned to use testing as part of their high school graduation requirements, as a means to identify students needing remediation, or for other purposes. Fifteen States had already begun using testing for their graduating classes, and five more had plans to do so.

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[2] An update of State requirements for high school graduation is available in the Education Commission of the States publication, *State Education Leader*, January 1984. It was not available at the time data entries for this report were being compiled.

State University Admissions Requirements

During the summer of 1982, the National Association of Secondary School Principals (NASSP) developed a survey to determine requirements for college admission to State universities. Revisions of these admissions policies could have a significant impact on the high school curriculum, causing more students to enroll in certain academic courses.

Admission requirements varied greatly from State to State, each State having established its own formula for admission. A high school diploma was sufficient in 18 States to allow admission to the State university system (entry 5.14). Some States, however, placed additional qualifications on entering students, such as adequate test scores or grade point averages. Revisions to college admission requirements for State universities were under study in 20 States. The course requirements most commonly increased were in mathematics and social sciences. While no State admissions requirements met the National Commission's recommendations for high school graduation, State university admission requirements came closest in Delaware, Iowa, North Carolina, and Vermont.

Table 5.1

Dropout Rates of 1980 High School Sophomores, by Sex and Selected Background Characteristics: Spring 1982

Background Characteristics	Total	Male	Female	Total	Male	Female
	Dropouts as Percent of Sophomores			Sample Size		
Total	13.6	14.7	12.6	28,119	13,905	14,214
Race/ethnicity:						
White, non-Hispanic	12.2	13.0	11.5	18,545	9,162	9,383
Black, non-Hispanic	17.0	20.3	14.1	3,712	1,721	1,991
Hispanic	18.0	18.1	18.0	5,039	2,589	2,450
Asian or Pacific Islander	3.1	3.5	2.7	426	213	213
Socioeconomic status:						
Low	17.4	17.8	17.1	7,057	3,143	3,914
Middle	8.9	9.6	8.3	11,836	5,822	6,014
High	5.2	7.0	3.2	5,876	3,141	2,735
Unknown	31.6	32.3	30.9	3,350	1,799	1,551
Self-reported grades:						
Mostly A's	2.9	2.0	3.5	9,507	4,148	5,359
Mostly B's	8.1	7.6	8.4	11,559	5,553	6,006
Mostly C's	18.5	19.1	18.1	5,976	3,524	2,452
Mostly D's	42.5	41.7	44.1	834	547	287
Self-reported high school program:						
Academic	4.0	4.5	3.6	8,831	4,144	4,687
General	12.9	12.7	13.0	11,359	5,608	5,751
Vocational	16.1	18.9	13.2	5,119	2,622	2,497
Community type:						
Urban	18.9	20.8	17.0	6,384	3,080	3,304
Suburban	11.8	12.5	11.0	13,760	6,799	6,961
Rural	12.8	13.6	12.0	7,975	4,026	3,949
Region:[1]						
Northeast	11.3	13.4	9.0	6,282	3,092	3,190
North Central	12.0	12.2	11.7	5,720	2,808	2,912
South	15.2	16.4	14.0	11,068	5,455	5,613
West	16.6	17.0	16.3	5,050	2,550	2,500
Control of school:						
Public	14.5	15.5	13.6	24,611	12,200	12,411
Catholic	2.3	3.2	1.6	2,616	1,167	1,449
Other private	([2])	([2])	([2])	—	—	—

—Not applicable.

[1] The regions correspond to Bureau of the Census definitions. See the Definitions of Selected Terms in the Appendix.

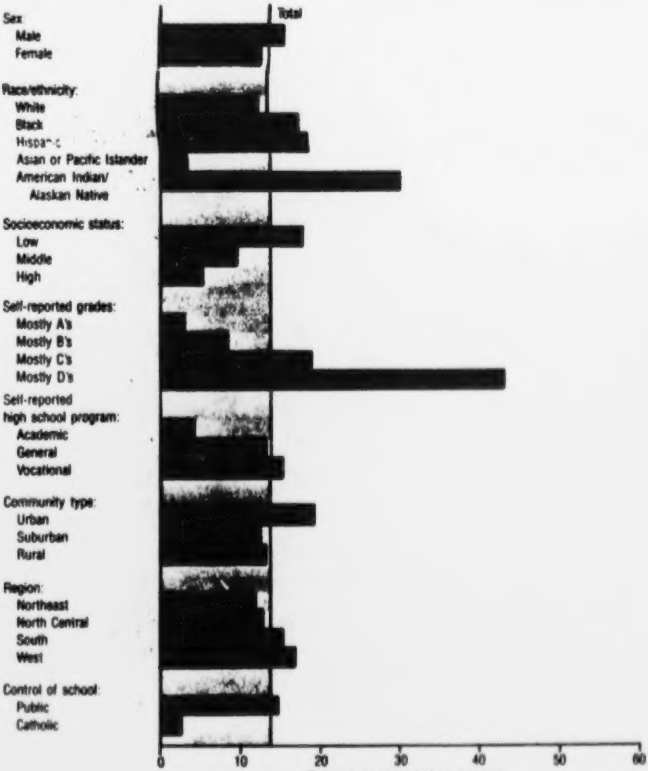
[2] Small sample size precludes showing percents.

NOTE: The standard error of the difference between two percentages (d) can be approximated by taking the square root of the sum of the standard errors for p_1 and p_2. That is, s.e. (d) = $[\text{s.e.}(p_1)^2 + \text{s.e.}(p_2)^2]^{1/2}$, where s.e. (p) = $D[p(100-p)/n]^{1/2}$, n is the sample size, and D is a correction factor estimated to be 1.6. The above approximation generally is conservative.

SOURCE: U.S. Department of Education, National Center for Education Statistics, "High School Dropouts: Descriptive Information from High School and Beyond," Bulletin, NCES 83-221b, November 1983.

Chart 5.1

Dropout Rates of 1980 High School Sophomores



Among the sophomore class of 1980, American Indians/Alaskan Natives had the highest dropout rate (29 percent) of any racial/ethnic group. Higher dropout rates were also associated with low socioeconomic status, poor academic performance, and enrollment in non-academic programs.

Table 5.2

Reasons Cited by 1980 Sophomore Dropouts for Leaving High School Before Graduation, by Sex and Race/Ethnicity: Spring 1982

Reasons[1]	Total	Male			Female		
		Total	White[2]	Minority[3]	Total	White[2]	Minority[3]
	Percent						
School-related:							
School was not for me	33.1	34.8	40.6	14.8	31.1	34.1	24.9
Had poor grades	33.0	35.9	38.4	31.2	29.7	30.8	26.6
Couldn't get along with teachers	15.5	20.6	19.6	22.0	9.5	10.2	8.1
Expelled or suspended	9.5	13.0	12.3	14.3	5.3	6.3	3.2
Didn't get into desired program	6.1	7.5	4.7	12.8	4.5	4.2	5.0
School grounds too dangerous	2.3	2.7	2.9	2.2	1.7	1.1	3.1
Family-related:							
Married or planned to get married	17.8	6.9	7.8	5.5	30.7	38.4	19.2
Had to support family	11.1	13.6	9.3	21.5	8.3	7.1	10.8
Was pregnant	10.9	—	—	—	23.4	20.5	28.2
Peer-related:							
Couldn't get along with students	5.5	5.4	4.7	6.6	5.9	6.0	5.7
Friends were dropping out	4.6	6.5	6.7	6.0	2.4	2.7	1.7
Health-related:							
Illness or disability	5.5	4.6	4.6	4.7	6.5	5.3	9.0
Other:							
Offered job and chose to work	19.5	26.9	28.4	24.1	10.7	9.7	12.8
Wanted to travel	6.6	7.6	7.3	6.5	6.5	8.5	2.4
Wanted to enter military	4.3	7.2	6.7	8.3	.8	.6	1.1
Moved too far from school	3.6	2.2	2.2	2.2	5.3	5.2	5.5
Sample size	2,286	1,185	648	537	1,101	615	486

—Not applicable

[1] Students might report more than one reason.

[2] Includes Asian Americans, only 18 in number, because they responded with similar reasons for dropping out.

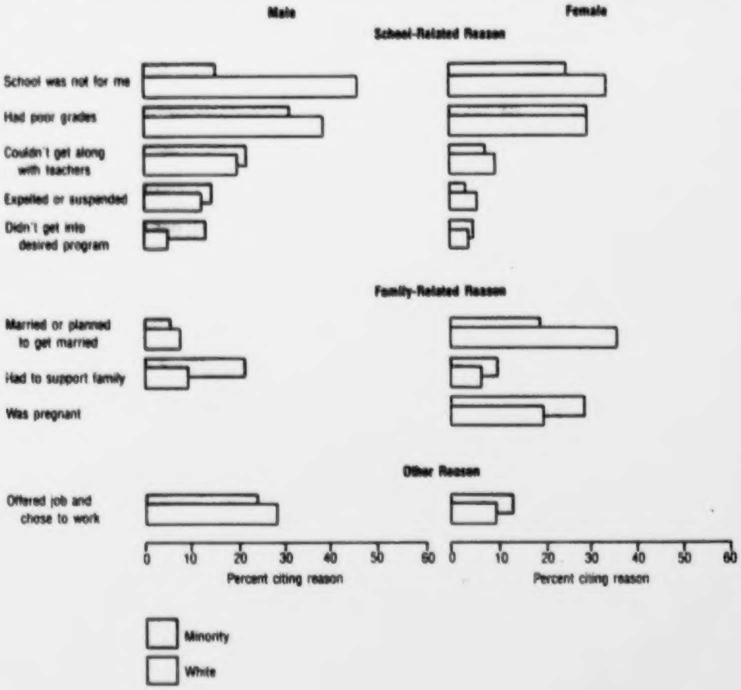
[3] Includes Hispanics, blacks, and American Indians/Alaskan Natives.

NOTE: The standard error of the difference between two percentages (d) can be approximated by taking the square root of the sum of the standard errors for p_1 and p_2. That is, $s.e.(d) = [s.e.(p_1)^2 + s.e.(p_2)^2]^{1/2}$, where $s.e.(p) = D[p(100-p)/n]^{1/2}$, n is the sample size, and D is a correction factor estimated to be 1.6. The above approximation generally is conservative.

SOURCE: U.S. Department of Education, National Center for Education Statistics, "High School Dropouts: Descriptive Information from High School and Beyond," Bulletin, NCES 83-221b, November 1983.

Chart 5.2

Reasons Cited by 1980 Sophomore Dropouts for Leaving High School Before Graduation



When 1980 sophomore dropouts were asked why they left high school, white males most frequently indicated they did not like school. Minority males most often cited poor grades; white females indicated marriage and a dislike for school; and minority females cited poor grades and pregnancy.

Table 5.3

Distribution of High School Seniors Expecting to Attain Designated Levels of Education, by Sex: Spring 1972, 1980, and 1982

	All Seniors			Males			Females		
Highest Level Expected*	1972	1980	1982	1972	1980	1982	1972	1980	1982
					Percentage Distribution				
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Less than high school graduation	2.2	.4	2.5	2.4	.6	2.9	2.0	.3	2.1
High school graduation only	16.7	19.4	18.0	13.1	20.4	21.0	20.2	17.9	15.1
Vocational, trade, or business school	18.0	19.6	19.1	17.4	20.1	20.0	18.6	18.9	18.3
Junior college	12.8	15.1	16.5	11.5	11.7	13.8	14.1	18.1	19.2
4-year college or university	37.6	25.3	19.1	39.2	25.8	18.4	36.0	25.1	19.8
Graduate or professional school	12.6	20.2	15.6	16.3	21.2	15.1	9.1	18.8	16.1
Don't know	—	—	9.1	—	—	8.8	—	—	9.4

—Not applicable.

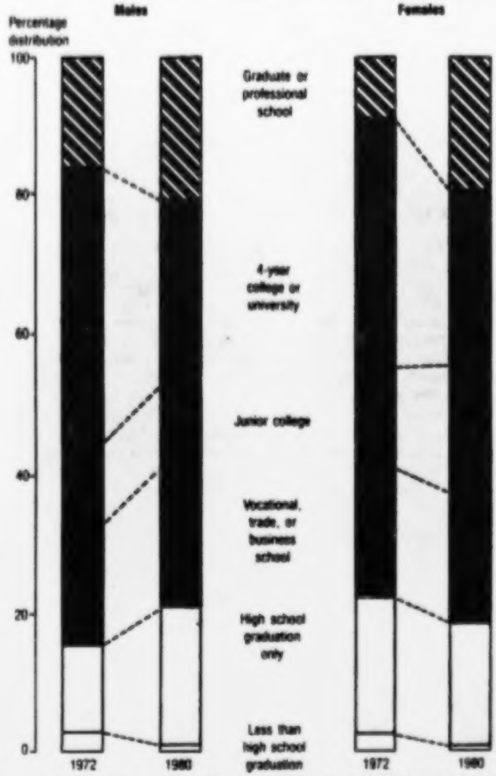
*The question formats and answer choices for 1972, 1980, and 1982 seniors were not identical. The 1972 questionnaire asked the students to indicate the highest level of education they planned to attain. The 1980 and 1982 questionnaires asked, "As things stand now, how far in school do you think you will get?" While the wording of the answer choices in 1972 and 1980 was more or less comparable, the inclusion of a "don't know" choice in 1982 reduces comparability with the earlier years.

NOTE: Details may not add to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *High School Seniors: A Comparative Study of the Classes of 1972 and 1980*, forthcoming, and unpublished tabulations (January 1983).

Chart 5.3

Distribution of 1972 and 1980 High School Seniors Expecting to Attain Designated Levels of Education



The percentage of high school seniors expecting no further education increased for males between 1972 and 1980 from 16 percent to 21 percent, but declined for females from 22 percent to 18 percent. The percentage of female seniors expecting to attend graduate or professional school more than doubled during that same period, increasing from 9 percent in 1972 to 20 percent in 1980.

Table 5.4

Postsecondary Education Participation Rates of High School Graduates Immediately Following Graduation, by Socioeconomic Status (SES), Sex, Race/Ethnicity, and Academic Performance: Fall 1972 and Fall 1980

	Percent Participating in Fall 1972				Percent Participating in Fall 1980			
Characteristic	Total[1]	4-Year Institutions	2-Year Institutions	Other[2]	Total[1]	4-Year Institutions	2-Year Institutions	Other[2]
All graduates	53	30	16	7	54	31	18	5
Male	54	31	17	6	49	30	16	4
Female	53	29	15	9	58	32	19	6
White, non-Hispanic	55	32	16	7	56	33	18	5
Black, non-Hispanic	47	26	12	9	47	30	14	5
Hispanic	46	16	21	8	40	16	18	5
Low performer	30	8	12	10	27	9	13	6
Median performer	53	26	20	8	56	29	22	5
High performer	79	60	15	4	81	65	15	3
Low SES	34	14	11	8	36	17	15	5
Male	33	15	12	6	32	16	14	4
Female	35	14	11	10	37	17	15	5
White, non-Hispanic	31	12	11	8	33	15	15	5
Black, non-Hispanic	39	20	10	10	41	24	13	4
Hispanic	41	15	18	8	32	13	14	5
Low performer	27	8	10	9	23	8	10	6
Median performer	36	16	11	9	41	19	19	4
High performer	62	41	18	4	62	44	16	3
Middle SES	51	25	18	8	53	30	19	5
Male	51	26	18	7	48	28	18	3
Female	50	24	16	10	58	31	21	6
White, non-Hispanic	51	25	18	8	54	30	19	5
Black, non-Hispanic	55	34	14	8	53	36	14	4
Hispanic	51	17	25	9	46	18	23	5
Low performer	30	8	12	10	28	10	14	6
Median performer	51	22	20	9	54	28	22	5
High performer	73	49	19	5	80	60	19	3
High SES	79	57	18	4	77	55	19	4
Male	78	56	18	3	73	51	18	4
Female	80	57	17	6	82	61	20	3
White, non-Hispanic	79	57	18	4	78	56	19	4
Black, non-Hispanic	81	53	21	8	70	48	21	2
Hispanic	([3])	([3])	([3])	([3])	74	45	20	10
Low performer	46	16	22	9	49	18	23	9
Median performer	74	43	25	6	75	44	28	4
High performer	89	76	11	2	86	75	10	3

[1] Details may not add to totals because of rounding and because respondents in 1980 could have indicated that they attended more than one type of postsecondary institution.

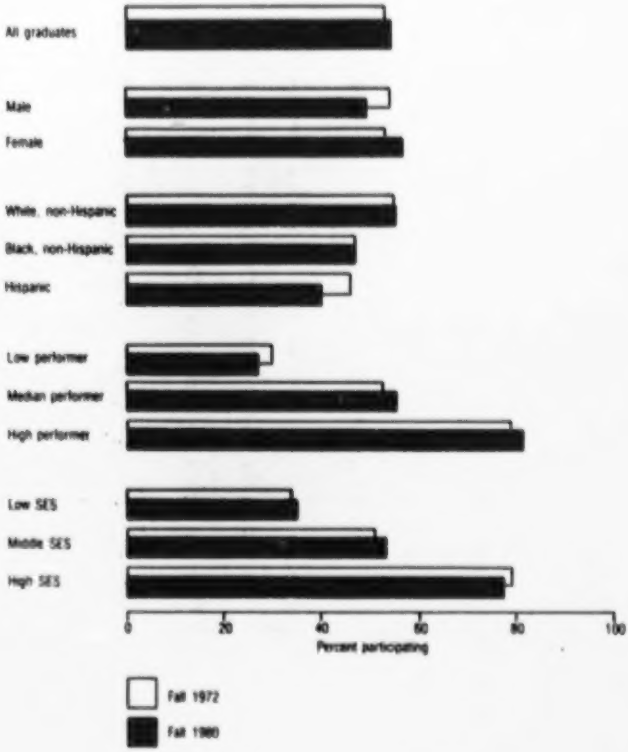
[2] Includes vocational, trade, and business schools and schools that could not be classified otherwise.

[3] Small sample size precludes showing percents.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Longitudinal Study of the High School Class of 1972 and High School and Beyond, unpublished tabulations (December 1983).

Chart 5.4

Postsecondary Education Participation of High School Graduates Immediately Following Graduation



While postsecondary enrollment rates of recent high school graduates remained stable overall between fall 1972 and fall 1980, rates dropped slightly among males and Hispanics and rose among females.

Table 5.5
Average Number of Carnegie Units Earned by 1982 High School Graduates in Selected Subject Areas, by Control of School, Sex, Race/Ethnicity, Performance Group, Self-Reported High School Program, and Educational Aspiration: 1982

Characteristic	Average Units Earned in All Subjects	Average Units Earned in Selected Subject Areas					
		English	Mathematics	Science	Social Studies	Foreign Language	Computer Science
All graduates	21.8	3.8	2.6	2.1	3.1	1.1	0.1
Control of school:							
Public	21.6	3.8	2.5	2.1	3.0	1.0	.1
Catholic	23.8	4.2	3.3	2.5	3.5	2.0	.1
Other private[1]	21.3	4.0	3.1	2.6	3.4	1.9	([2])
Sex:							
Male	21.6	3.7	2.6	2.3	3.1	.9	.1
Female	22.0	3.9	2.5	2.1	3.1	1.2	.1
Race/ethnicity:							
White, non-Hispanic	21.9	3.8	2.7	2.3	3.1	1.1	.1
Black, non-Hispanic	21.1	3.8	2.4	2.0	2.9	.7	.1
Hispanic	21.7	3.7	2.2	1.8	3.0	.8	.1
Performance group:							
Low	20.8	3.5	1.9	1.6	2.8	.3	([2])
Middle	21.6	3.8	2.4	2.0	3.1	.8	.1
High	22.6	4.0	3.4	2.9	3.2	1.9	.2
Self-reported high school program:							
Academic	22.5	4.0	3.3	2.6	3.2	1.8	.1
General	21.3	3.7	2.2	1.9	3.1	.6	.1
Vocational	21.4	3.6	2.0	1.6	2.9	.4	.1
Educational aspiration:							
High school	20.9	3.6	2.0	1.7	2.9	.4	([2])
Vocational training	21.5	3.6	2.1	1.7	3.1	.4	.1
Some college	21.8	3.8	2.5	2.0	3.1	1.0	.1
College graduate	22.4	4.0	3.2	2.6	3.2	1.5	.2
Postgraduate	22.4	4.0	3.3	2.9	3.2	1.9	.1

[1] Care should be taken when making comparisons with the "other private" category due to small sample size and a high non-response rate.

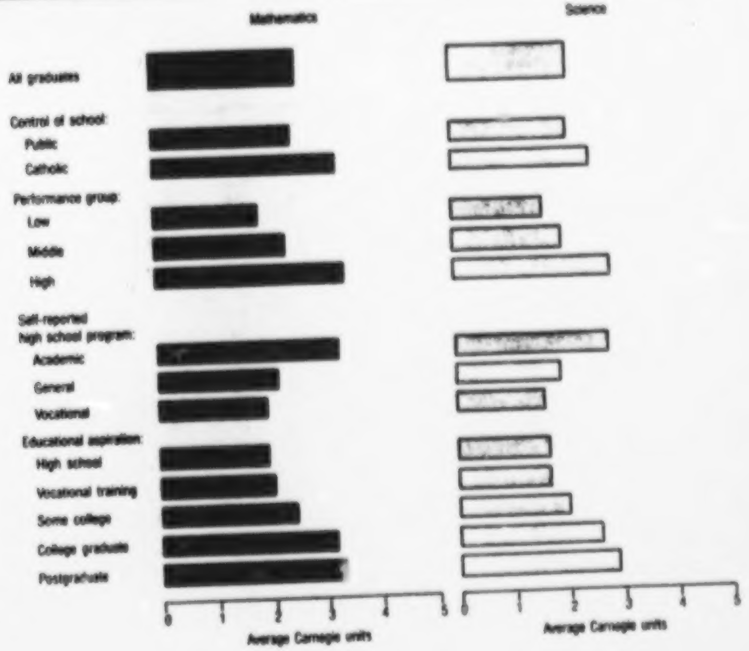
[2] Less than 0.05 unit.

NOTE: The Carnegie unit is a standard of measurement that represents one credit for the completion of a 1-year course.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Study, transcript file, unpublished tabulations (September 1983).

Chart 5.5

Carnegie Units Earned in Mathematics and Science by 1982 High School Graduates



Graduates of Catholic high schools in 1982 generally earned more math and science credits than graduates of public schools. Additional math and science coursework was associated with academic and high performance subgroups, and with higher postsecondary educational aspirations.

Table 5.6

Percent of 1982 High School Graduates Who Met Curricular Recommendations of the National Commission on Excellence in Education, by Subject Area and Selected School Characteristics: 1982

Characteristic	All Recommendations[1]	All Except Foreign Language	All Except Computer Science	All Except Foreign Language and Computer Science	English (4 years)	Mathematics (3 years)	Science (3 years)	Social Studies (3 years)	Foreign Language (2 years)	Computer Science (0.5 years)
All graduates	1.9	2.6	8.4	13.4	58.6	46.2	30.4	66.4	32.2	10.7
Grade span of school:										
Kindergarten to 12th grade	1.5	2.6	9.2	13.3	67.1	45.0	33.0	73.1	30.2	16.7
9th to 12th grade	1.8	2.4	8.8	12.9	57.7	46.6	30.6	64.3	36.2	12.5
10th to 12th grade	2.0	2.9	7.2	13.0	50.2	46.5	29.1	63.0	30.3	14.5
School enrollment size:										
Less than 600	1.0	1.5	8.1	14.6	60.9	41.1	32.8	69.4	29.5	7.4
600 to 1,000	2.4	3.4	9.2	13.4	57.8	47.5	30.6	66.2	34.6	14.4
More than 1,000	1.5	1.9	7.0	12.2	53.2	46.6	30.8	63.6	35.6	13.4
Region:[2]										
New England	8.8	4.9	14.7	16.8	65.5	66.3	45.5	58.2	61.8	18.0
Middle Atlantic	5.8	5.8	21.1	26.5	73.4	56.1	46.4	81.8	51.5	15.8
South Atlantic	1.3	1.5	16.7	16.4	66.5	48.0	38.5	63.2	31.8	10.3
East South Central	.1	.7	7.6	16.9	66.1	48.0	26.9	58.8	16.0	5.6
West South Central	.3	.6	4.5	16.2	72.8	43.6	26.4	64.3	14.5	6.6
East North Central	.6	1.6	3.9	7.8	42.2	46.6	27.0	54.1	29.7	14.9
West North Central	1.4	0.9	4.9	10.7	47.5	46.2	29.7	79.1	17.7	17.8
Mountain	1.2	1.7	1.8	7.8	45.5	39.6	22.2	66.1	18.4	11.6
Pacific	.6	.9	4.9	6.6	44.2	41.6	18.9	76.4	41.2	10.1
Community type:										
Urban	1.6	2.1	8.9	12.2	58.0	45.3	30.9	61.3	35.8	13.0
Suburban	2.6	3.6	9.1	14.1	58.9	50.2	30.1	68.4	38.1	13.0
Rural	1.5	2.2	7.1	12.9	60.5	46.3	29.1	64.6	24.0	8.0

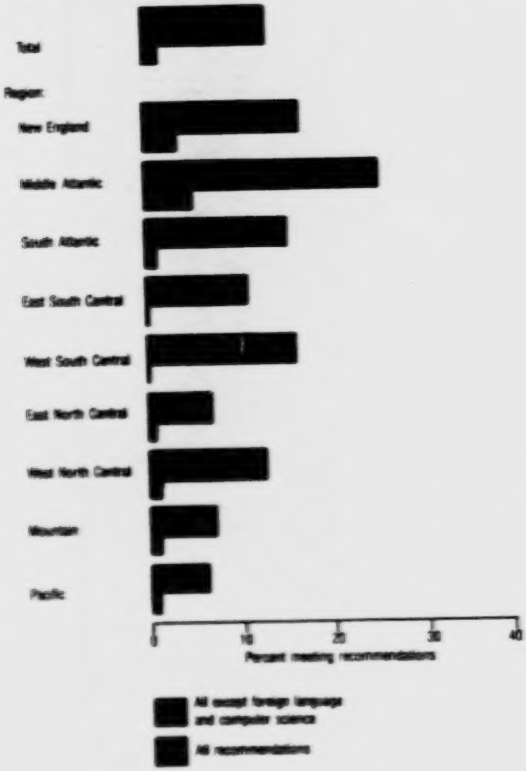
[1] The National Commission on Excellence in Education recommended that all students seeking a high school diploma take the following curriculum during their 4 years of high school: (a) 4 years of English, (b) 3 years of mathematics, (c) 3 years of science, (d) 3 years of social studies, and (e) a half year of computer science. For college-bound students, 2 years of foreign language in high school were strongly recommended.

[2] The regions correspond to the Bureau of the Census definitions. See the Definitions of Selected Terms in the Appendix.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Study, transcript file, unpublished tabulations (October 1983).

Chart 5.6

Percent of 1982 High School Graduates Who Met Various Sets of Curricular Recommendations of the National Commission on Excellence in Education



High school graduates of 1982 in the Middle Atlantic region were most likely to have met various recommendations made by the National Commission on Excellence in Education.

Table 5.7

Percent of 1982 High School Graduates Who Met Curricular Recommendations of the National Commission on Excellence in Education, by Educational Aspiration and Subject Area: 1982

Recommendation*	All Graduates	Educational Aspiration: High School Graduation	Educational Aspiration: Some Postsecondary but Less Than 4 Years of College	Educational Aspiration: 4 or More Years of College	Educational Aspiration: Aspiration Not Indicated
All recommendations	1.8	0.5	0.4	3.7	0.5
All except foreign language	2.6	.6	1.0	5.8	1.1
All except computer science	8.4	2.2	4.2	15.6	4.2
All except foreign language and computer science	13.4	4.8	8.0	22.6	8.7
English (4 years)	58.6	50.7	54.3	66.5	55.0
Mathematics (3 years)	48.2	20.3	33.2	71.4	32.7
Science (3 years)	28.4	12.4	19.3	40.9	20.0
Social studies (3 years)	65.4	60.2	63.6	69.1	65.9
Foreign language (2 years)	33.2	12.1	21.0	56.7	18.7
Computer science (0.5 years)	12.7	5.7	10.4	18.2	10.1

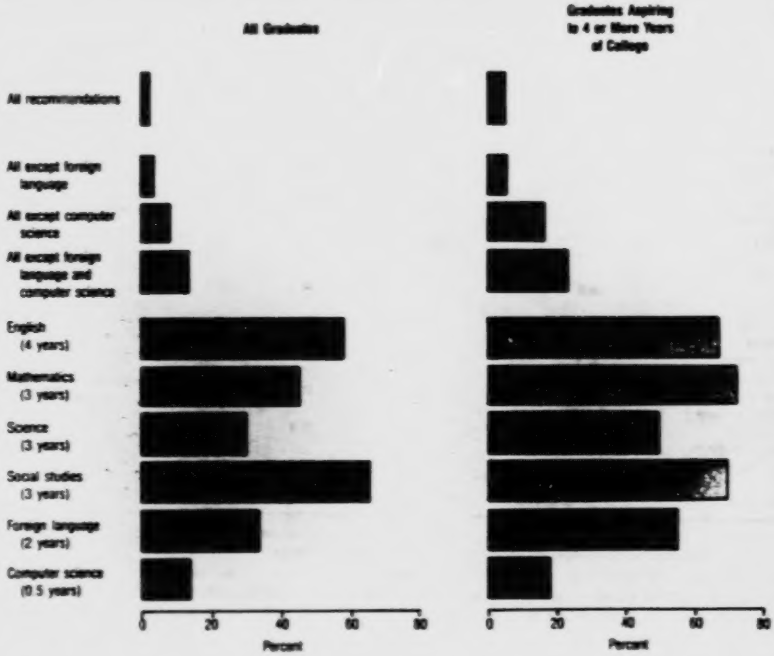
*The National Commission on Excellence in Education recommended that all students seeking a high school diploma take the following curriculum during their 4 years of high school: (a) 4 years of English; (b) 3 years of mathematics; (c) 3 years of science; (d) 3 years of social studies; and (e) a half year of computer science. For college-bound students, 2 years of foreign language in high school were strongly recommended.

NOTE: The standard errors for this table have been computed and are provided in the Data Sources in the Appendix.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Study, transcript file, unpublished tabulations (July 1983).

Chart 5.7

Percent of 1982 High School Graduates Who Met Curricular Recommendations of the National Commission on Excellence in Education, by Educational Aspiration



Of the 1982 high school graduates, college aspirants were most likely to have met the curricular recommendations of the National Commission on Excellence in Education.

Table 5.8

Average Number of Carnegie Units Earned by 1982 High School Graduates in Selected Academic Subjects, by Grade Level and Selected Background Characteristics: 1982

Characteristic	Average Units Earned in All Subjects	Average Units Earned in Selected Academic Subjects Only[1]				
			Grade in School			
		Total	9th Grade	10th Grade	11th Grade	12th Grade
All graduates	21.8	12.9	3.6	3.5	3.2	2.6
Control of school:						
Public	21.5	12.5	3.5	3.4	3.2	2.5
Catholic	24.0	15.7	4.3	4.4	3.9	3.1
Other private[2]	21.1	15.3	4.1	4.2	4.0	3.1
Race/ethnicity:						
White, non-Hispanic	21.9	13.2	3.7	3.6	3.3	2.6
Black, non-Hispanic	21.1	11.9	3.2	3.2	3.0	2.5
Hispanic	21.7	11.7	3.3	3.2	2.9	2.2
Socioeconomic status:						
Low	21.3	11.5	3.4	3.2	2.8	2.2
Middle	21.8	12.7	3.5	3.5	3.2	2.5
High	22.3	14.7	3.9	4.0	3.8	3.0
Self-reported high school program:						
Academic	22.5	15.3	4.0	4.1	4.0	3.3
General	21.3	11.7	3.3	3.2	2.9	2.3
Vocational	21.4	10.7	3.4	3.0	2.5	1.8
Region:						
Northeast	22.0	14.4	4.0	4.0	3.6	2.8
North Central	21.5	12.6	3.6	3.5	3.1	2.5
South	21.5	12.2	3.4	3.3	3.1	2.5
West	22.4	12.2	3.3	3.2	3.2	2.5

[1] Includes English, mathematics, science, and social studies.

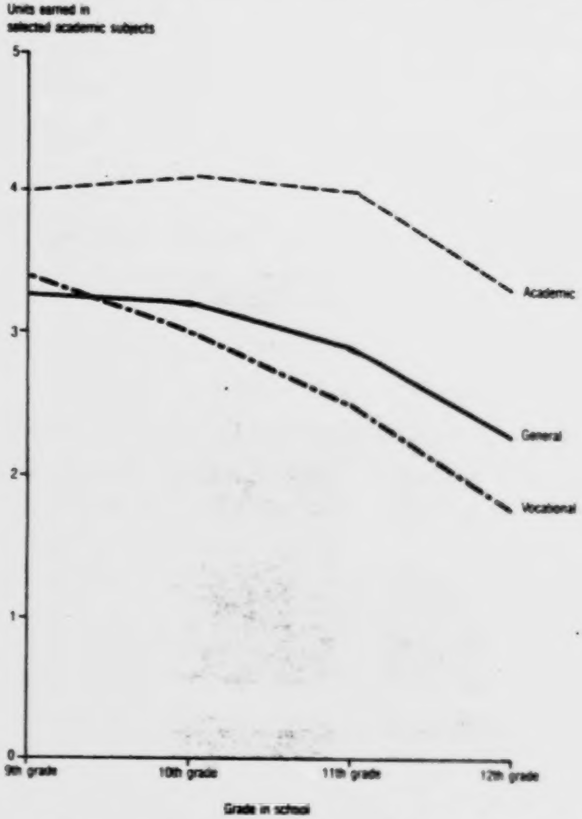
[2] Care should be taken when making comparisons with the "other private" category due to small sample size and a high non-response rate.

NOTE: The Carnegie unit is a standard of measurement that represents one credit for the completion of a 1-year course.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Study, transcript file, unpublished tabulations (October 1983).

Chart 5.8

Average Number of Carnegie Units Earned in Selected Academic Subjects by 1982 High School Graduates, by Self-Reported Program



High school graduates of 1982 took less coursework in academic basics in their senior year than in earlier grades, regardless of their program.

Table 5.9

Average Number of Carnegie Units Earned by 1982 High School Graduates, by Grade Level and Subject Area: 1982

Subject Area	Total	Grade in School			
		9th Grade	10th Grade	11th Grade	12th Grade
English	3.8	1.0	1.0	1.0	0.9
Mathematics	2.6	.9	.8	.6	.4
Science	2.2	.7	.7	.4	.3
Social studies	3.1	.7	.6	1.0	.8
Foreign language	1.1	.3	.4	.2	.1
Computer science	.1	(*)	(*)	(*)	.1

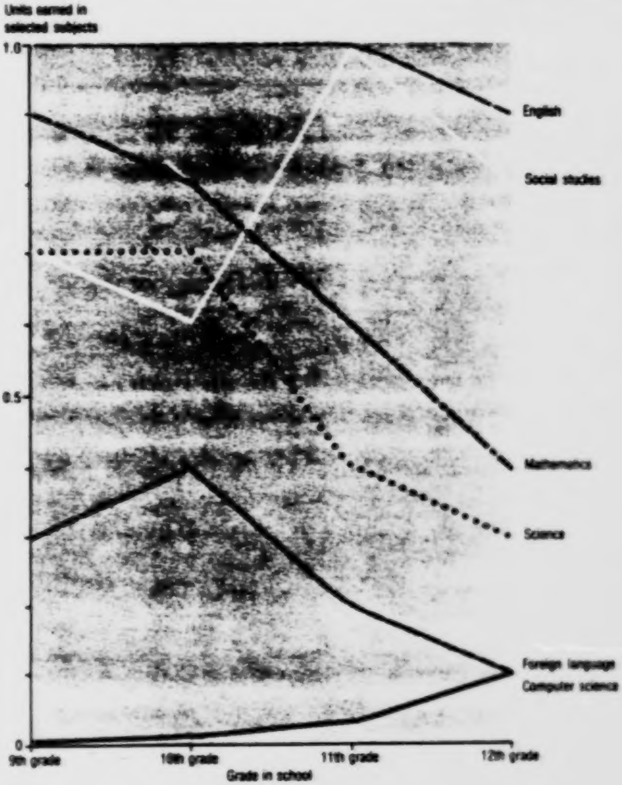
*Less than 0.05 unit.

NOTE: The Carnegie unit is a standard of measurement that represents one credit for the completion of a 1-year course.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Study, transcript file, unpublished tabulations (October 1983).

Chart 5.9

Average Number of Carnegie Units Earned in Selected Subjects by 1982 High School Graduates



High school graduates averaged half the number of mathematics and science credits in their senior year as in their freshman year.

Table 5.10

Change From 1982 in Schools Using Microcomputers and Weekly Use of Microcomputers in Elementary and Secondary Schools, by Type of Activity and Level: 1983

Level	1982		1983		
	Number of Schools With Microcomputers	Percent of All Schools	Number of Schools With Microcomputers	Percent of All Schools	Percent Change 1982 to 1983
Elementary	5,142	9.4	14,160	27.4	175.4
Junior high	2,441	29.3	6,015	48.2	146.4
Senior high	6,403	42.8	10,318	82.5	61.1

Activity	Minutes-Per-User During an Average Week in Schools With Microcomputers				
	Median Minutes	Percentage Distribution			
		Total	1 to 15 Minutes	16 to 60 Minutes	More Than 60 Minutes
Elementary					
Programming, computer literacy	19	100	49	47	4
Drills, remedial work, math, language	13	100	60	40	(*)
Learning games, recreational games	12	100	73	27	(*)
Secondary					
Programming, computer literacy	55	100	18	38	44
Drills, remedial work, math, language	17	100	48	43	9
Learning games, recreational games	11	100	56	35	9
Word processing, data processing, lab, other	38	100	28	41	31

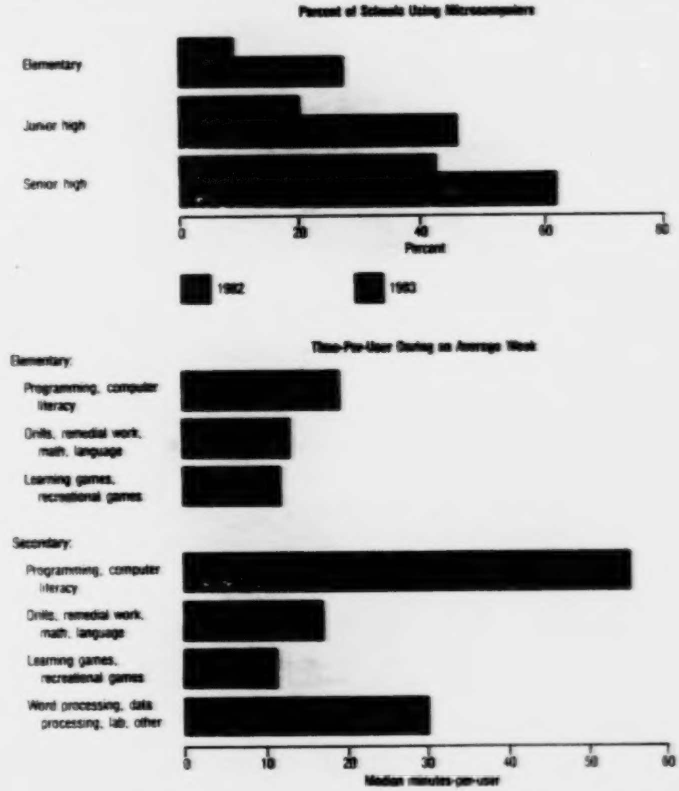
*Less than 0.5 percent.

NOTE: The secondary grade level includes junior and senior high school. Details may not add to totals because of rounding.

SOURCE: The Johns Hopkins university, Center for Social Organization of Schools, "School Uses of Microcomputers," Issue Number 2, 1983; and Quality Education Data, Inc., "Microcomputer Data, Presentation to: NAVA Materials Council," January 1983.

Chart 5.10

Use of Microcomputers in Elementary and Secondary Schools



The percentage of schools using microcomputers more than doubled at the junior high level and increased by 61 percent at the senior high level between 1982 and 1983. Microcomputer users in secondary schools generally spent more time in programming and computer literacy instruction than in other computer activities.

Table 5.11

Number of Total Carnegie Units Required for High School Graduation in 1980, Approved or Proposed Changes, and Year Effective, by State: 1982–83

State	1980 Base	Changes from 1980 Base: Effective During 1982–83	Additional Units Approved: Carnegie Units	Additional Units Approved: Year Effective[1]	Additional Units Proposed: Carnegie Units	Additional Units Proposed: Year Effective[1]
Alabama[2]	20				+2 or +4	1987
Alaska	19				+4	1986
Arizona	16		+2	1988		
Arkansas	16				18	Unknown
California						
Colorado		16				
Connecticut[2]						
Delaware	18					
District of Columbia	17½		+3	1984		
Florida						
Georgia	20					
Hawaii						
Idaho	18		+2	1987		
Illinois	16					
Indiana	16	+3				
Iowa						
Kansas	17					
Kentucky	18				+2	1987
Louisiana	20	+2				
Maine	16					
Maryland	20					
Massachusetts						
Michigan						
Minnesota	15					
Mississippi	16					
Missouri						
Montana	16					
Nebraska	16					
Nevada	19		+1	1988		
New Hampshire	16				+2	1988
New Jersey						
New Mexico	20				+2	1987
New York	16/18					
North Carolina	16	+2			+2	1987
North Dakota	17				+3	Unknown
Ohio	17		+1	1988		
Oklahoma	18		+2	1987		
Oregon	21					
Pennsylvania	13					
Rhode Island[2]	16				+1	Unknown
South Carolina	18				+2	Unknown
South Dakota	16				+2	1988
Tennessee	18				+2	Unknown
Texas	18		+2	1988		
Utah	15					
Vermont	16					
Virginia	18				+2	1988
Washington	15					
West Virginia	17		+3	1985		
Wisconsin					18½	
Wyoming	18					

[1] First graduating class subject to changed standard.

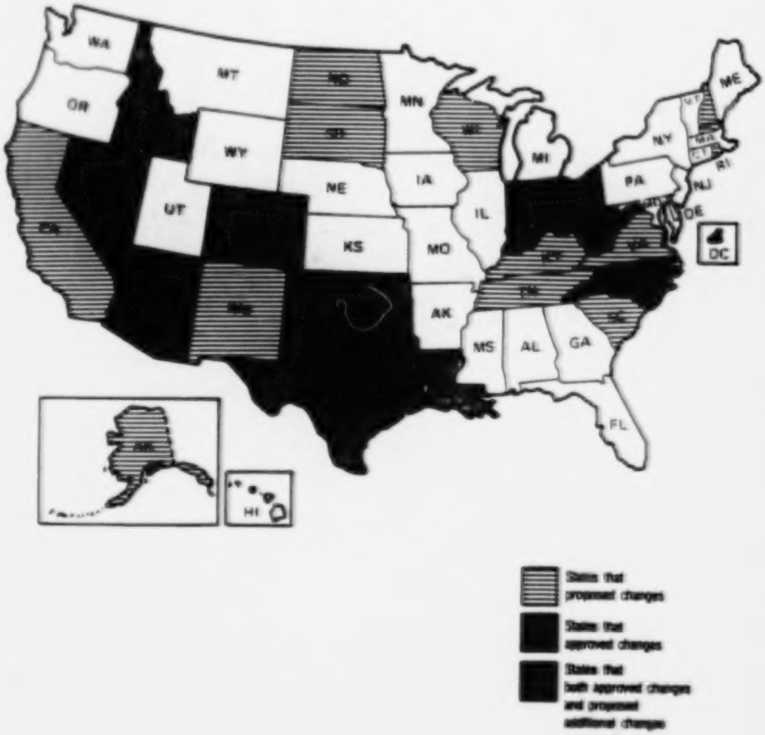
[2] Change in subject requirements but not in total net requirements.

NOTE: The Carnegie unit is a standard of measurement that represents one credit for the completion of a 1-year course.

SOURCE: National Association of Secondary School Principals, *State-mandated Graduation Requirements*, 1980; and U.S. Department of Education, National Center for Education Statistics, informal telephone interviews, February 1983.

Chart 5.11

States That Have Approved or Proposed Changes in Requirements for High School Graduation Between 1980 and 1983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States that proposed changes
States that approved changes
States that both approved changes and proposed additional changes

Between 1980 and 1983, 22 States and the District of Columbia approved or proposed increases in the number of units required for high school graduation. These States were generally clustered in the Middle Atlantic, Ohio Valley, Southwest, and West.

Table 5.12

Number of Carnegie Units Required in Mathematics and Science for High School Graduation in 1980, Approved or Proposed Changes, by State: 1982–83

State	Mathematics				Science			
		Changes From 1980 Base, in Carnegie Units				Changes From 1980 Base, in Carnegie Units		
	1980 Base	Effective During 1982–83	Additional Units Approved	Additional Units Proposed	1980 Base	Effective During 1982–83	Additional Units Approved	Additional Units Proposed
Alabama*	1		+1		1			
Alaska	1				1			
Arizona	1			+1	1			+1
Arkansas								
California				+3				+2
Colorado								
Connecticut								
Delaware	1				1			
District of Columbia	1		+1		1		+1	
Florida								
Georgia	1				1			
Hawaii	2				2			
Idaho	1		+1		2			
Illinois								
Indiana	1	+1			1	+1		
Iowa								
Kansas	1				1			
Kentucky	2			+1	2			
Louisiana	2	+1			2			
Maine								
Maryland	2				2			
Massachusetts								
Michigan								
Minnesota								
Mississippi	1				1			
Missouri	1				1			
Montana	2				1			
Nebraska								
Nevada	1		+1			1		
New Hampshire	1			+1	1			+1
New Jersey	2				1			
New Mexico	2				1			
New York	1				1			
North Carolina	1				2			
North Dakota	1			+1	2			
Ohio	1		+1			1		
Oklahoma	1		+1			1	+1	
Oregon	1				1			
Pennsylvania	1				1			
Rhode Island*	1			+2	1			+1
South Carolina	2			+1	1			+1
South Dakota	1			+1	1			+1
Tennessee	1			+1	1			+1
Texas	2		+1			2		
Utah	1				1			
Vermont								
Virginia	1			+1	1			+1
Washington	3				2			
West Virginia	1		+1			1		
Wisconsin				+3				+3
Wyoming								

*Change in subject requirements but not in total unit requirements.

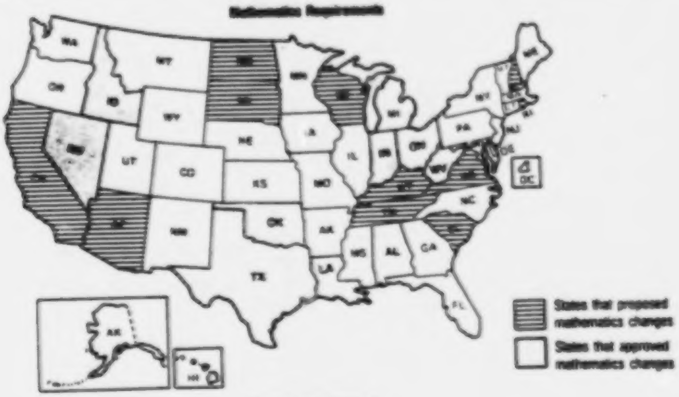
NOTE: The Carnegie unit is a standard of measurement that represents one credit for the completion of a 1-year course.

SOURCE: National Association of Secondary School Principals, *State-mandated Graduation Requirements, 1980*; and U.S. Department of Education, National Center for Education Statistics, informal telephone interviews, February 1983.

Chart 5.12

States That Approved or Proposed Changes in Mathematics and Science Requirements for High School Graduation

Mathematics Requirements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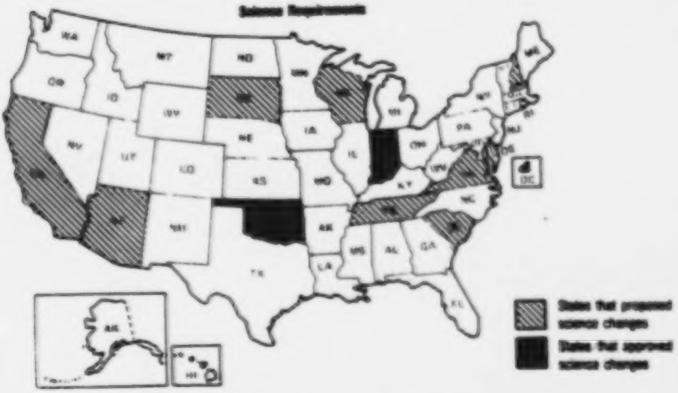
States that proposed mathematics changes
States that approved mathematics changes

Science Requirements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States that proposed science changes
States that approved science changes

Between 1980 and 1983, 20 States and the District of Columbia proposed or approved increases in the number of mathematics units required for high school graduation, and 12 approved or proposed changes in the number of science credits required.

Table 5.13

States Using Minimum-Competency Testing, by Government Level Setting Standards, Grade Levels Assessed, and Expected Uses of Standards: 1983

States Using Minimum Competency Testing	Government Level Setting Standards	Grade Levels Assessed	Expected Uses: Grade Promotion	Expected Uses: High School Graduation	Expected Uses: Early Exit	Expected Uses: Remediation	Expected Uses: Other	First Graduating Class Assessed
Alabama	State	3,6,9+		x		x		1985
Arizona[1]	State/local	8,12	x	x			x	1976
Arkansas	State	3,4,6,8		x				
California	State/local	4-11, 16 or 16+	x	x	x	x	x	1979
Colorado	Local	9,12		Local option				
Connecticut	State/local	3,5,7,9				x	x	
Delaware	State	11		x				1981
Florida	State/local	3,5,8,11	x	x	x			1983
Georgia	State	4,8,10+		x		x		1985
Hawaii[2]	State	9-12		x		x		1983
Idaho	State	9-12		Local option				1982
Illinois	Local	Local option					Local option	
Indiana	Local	3,6,8,10				x	x	
Kansas[3]	State	2-4,6,8,9,11,12					Local option	
Kentucky	State/local	3,5,7,8,10,11					x	
Louisiana	State	4-8,11	x	x			x	1982
Maine	State	8,11					x	
Maryland	State	3,7,9,11	x	x		x		1982
Massachusetts	Local	Local option					x	
Michigan	State	4,7,10					Local option	
Missouri	State	8					x	
Nebraska	Local	5+					x	
Nevada	State	3,6,9,12		x		x		1982
New Hampshire	State	4,8,12					Local option	
New Jersey	State	9-12		x		x	x	1985
New Mexico	State	Local option, 10					x	1981
New York	State	3,6,8-12		x		x		1979
North Carolina	State	1-3,6,9,11		x				1980
Ohio	Local	Local option				x		
Oklahoma	State	3,6,9,12					x	
Oregon	Local	Local option		x				1978
Rhode Island	State	4,8,10					x	
South Carolina	State	1-3,6,8,11				x	x	1989
Tennessee	State/local	4-6,8,11,12		x		x	x	1982
Texas	Not reported	3,5,9+				x		
Utah	Local	Local option		x				1980
Vermont	State	9-12		x			x	1981
Virginia	State/local	K-6,9-12		x				1981
Washington	Local	4,8					Local option	
Wisconsin	Local	1-4,5-8,9-12		Local option		x		

[1] Current legislation (1983) calls for the State to develop a minimum course of studies, criteria for high school graduation standards, and guidelines for grade-to-grade promotion. These initiatives are to be implemented by local education agencies.

[2] In Hawaii, students have 3 options: paper-pencil test; performance test; or course.

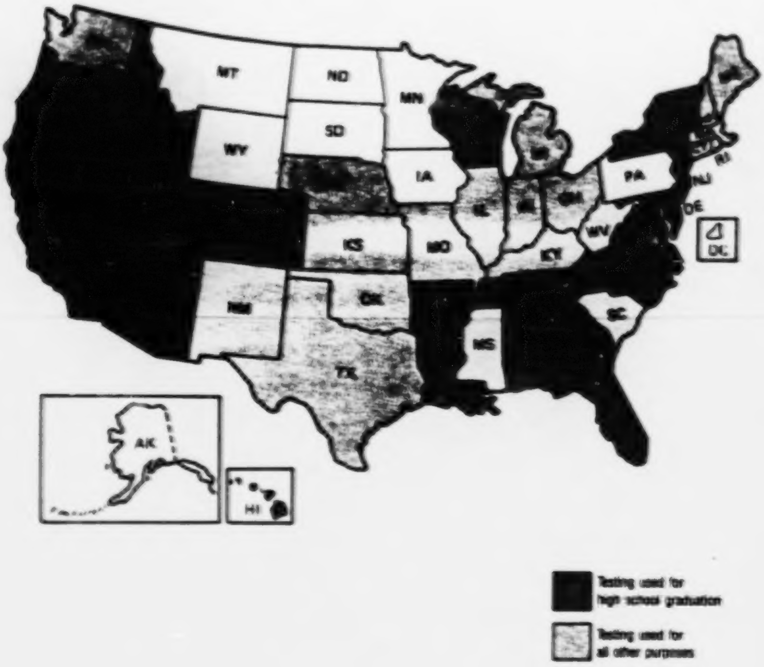
[3] The test expired in 1983; legislation is expected to renew for a 5-year period in 1984.

NOTE: Some States recorded dates for first high school graduating class to be assessed, but did not record expected use for high school graduation.

SOURCE: Education Commission of the States, Department of Research and Information, unpublished tabulations (November 1983).

Chart 5.13

Minimum-Competency Testing for High School Graduation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Testing used for high school graduation
Testing used for all other purposes

In 1983, 22 States used or expected to use minimum competency testing for high school graduation, and another 18 States used it for other purposes.

Table 5.14

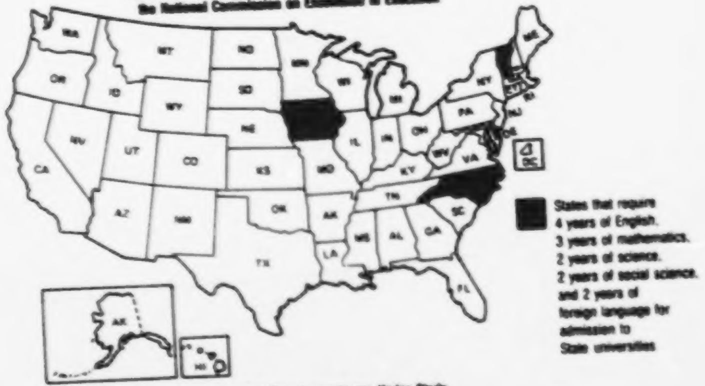
Number of Carnegie Units Required for State University Admission, by Subject Area and State: Fall 1982

State	Required Units, by Subject Area						Requirements Under Study
	English	Mathematics	Science	Social Science	Foreign Language	Other	
Alabama	4	2	1	1	Optional		X
Alaska	3	2	2 ←or→	2	2	5 academic	X
Arizona	4	2	1	2	1	7	X
Arkansas	3	1	1	1		1 additional math or science	X
California	4	2	1	1	2	1 advanced math, science, or language	X
Colorado	3	2	2	1	3	1 history, 3 electives	
Connecticut	4	3	1		2		X
Delaware	4	3	2	3	2		
District of Columbia		(An analysis of DC requirements was not included in the NASSP study)					
Florida						H.S. diploma	
Georgia	4	2	2	2		6	
Hawaii	3	1				4 academic	
Idaho						H.S. diploma	X
Illinois	3	2					X
Indiana	4		Any combination of 9 academic				
Iowa	4	3	2	2	2		
Kansas						H.S. diploma	
Kentucky						H.S. diploma	X
Louisiana						H.S. diploma	
Maine	4	3	2	1	2		
Maryland						H.S. diploma	X
Massachusetts						H.S. diploma	X
Michigan						H.S. diploma	
Minnesota	3	2		4		3 academic	
Mississippi	3	2		2		8 academic	
Missouri						H.S. diploma	X
Montana						H.S. diploma	
Nebraska						H.S. diploma	X
Nevada						H.S. diploma	
New Hampshire	4	2	1	3	2		
New Jersey	4	3			2	7 academic	X
New Mexico	3	2	2	2		4 academic plus fine arts	
New York	4	2	2	3			
North Carolina	4	3	Any combination of 7 in science or social science		2		
North Dakota						H.S. diploma	
Ohio						H.S. diploma	
Oklahoma						H.S. diploma	
Oregon						H.S. diploma	X
Pennsylvania	4	2	2				
Rhode Island	4	2	1	1	2	5	
South Carolina	4	2	2	2			X
South Dakota						12 academic	
Tennessee	2				2	H.S. diploma	
Texas	3	3	2	2	2	4	X
Utah	4	1					
Vermont	4	3	2	3	2		
Virginia	4	3	1	1	2		X
Washington	3	2	1	2	2	3	X
West Virginia	4	1					
Wisconsin	3	2	Any combination of 2 in science, social science, and foreign language			7	
Wyoming						H.S. diploma	X

NOTE: The Carnegie unit is a standard of measurement that represents one credit for the completion of a 1-year course.

SOURCE: National Association of Secondary School Principals, *College Admissions: New Requirements by the State Universities*, 1982.

States With Requirements Close to Recommendations of the National Commission on Excellence in Education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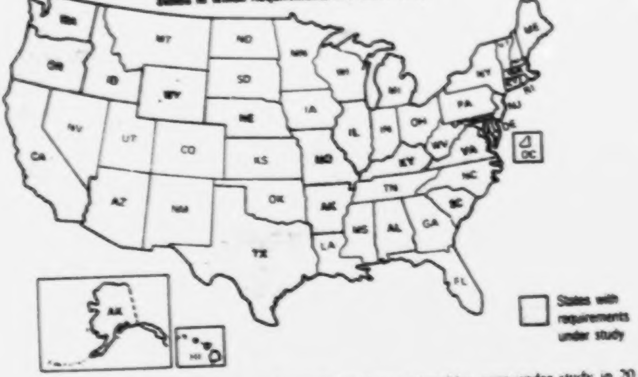
States that require 4 years of English, 3 years of mathematics, 2 years of science, 2 years of social science, and 2 years of foreign language for admission to State universities

States in Which Requirements are Under Study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States with requirements under study

College admission requirements for State universities were under study in 20 States in 1982. Although no State met the recommendations for high school graduation set forth by the National Commission on Excellence in Education, State university admission requirements came closest in Delaware, Iowa, Maine, North Carolina, and Vermont.

The 16th Annual Gallup Poll Of the Public's Attitudes Toward The Public Schools

by George H. Gallup

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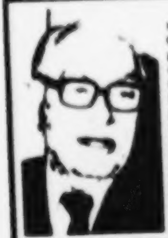
The annual Gallup Poll of the Public's Attitudes Toward the Public Schools, now financed by Phi Delta Kappa, is intended to be a continuing source of reliable information concerning trends in opinion about significant school questions. For school officials, the poll is valuable in at least two ways: it alerts decision makers to overall public reaction to a variety of school programs and policies, and it serves as a national benchmark against which local attitudes can be measured.

Local officials are welcome to use questions asked in the Gallup education surveys. The questions are not copyrighted. Moreover, no limits are placed on the use of information contained in these reports, beyond customary credit to the source and observance of the canons of accuracy and completeness of quotation.

Phi Delta Kappa's Dissemination Division, assisted by the Gallup Organization, is prepared to help school districts and other agencies survey local populations on education questions. For details of this service, called PACE (Polling Attitudes of the Community on Education), write or telephone Wilmer Bugher, associate executive secretary for administration, Phi Delta Kappa, P.O. Box 789, Bloomington, IN 47402. The phone number is 812/339-1156.

Illustration by Simon Page

Nearly 100 Phi Delta Kappans and education writers offered suggestions for this year's poll. We wish to thank them for their cooperation. We are also grateful to the panel assembled by Phi Delta Kappa last January to discuss poll questions with George Gallup and members of his staff at the headquarters of the National School Boards Association in Washington, D.C. The panel was composed of Adrienne Bailey, vice president for academic affairs, College Board; Michael J. Bakalis, professor of education and public management, School of Education, Northwestern University; David Bednarek, education writer for the *Milwaukee Journal*; Ben Brodinsky, education consultant; Jerome G. Kopp, president of Phi Delta Kappa and principal of Downey High School in Modesto, California; Anne Lewis, executive editor, *Education USA*; Glen Robinson, executive director, Educational Research Service; Thomas Shannon, executive director, National School Boards Association; John Vasconcellos, chairman, Assembly Ways and Means Committee, State of California; and Gary Wittlich, professor of music, Indiana University. Representing the Phi Delta Kappa headquarters staff were Lowell Rose, executive secretary; Robert W. Cole, Jr., editor, *Phi Delta Kappan*; and myself. — *Stanley Elam*, coordinator, Gallup-Phi Delta Kappa Education Poll.



This issue is dedicated to the memory of George H. Gallup, creator of scientific polling and one of the most influential men of this century. Dr. Gallup, who died in Switzerland on July 27, was particularly fond of the Gallup Poll of the Public's Attitudes Toward the Public Schools; it was his favorite project. We shall miss his guiding hand and his discerning intelligence and rare good humor. — The Editors

Purpose of the Study

THIS SURVEY, which measures the attitudes of Americans toward their public schools, is the 16th annual survey in this series. Funding for this survey was provided by Phi Delta Kappa, Inc. Each year the poll attempts to deal with issues of greatest concern both to educators and to the public. New as well as trend questions are included in this and every survey.

To insure that the survey would embrace the most important issues in the field of education, Phi Delta Kappa organized a meeting of various leaders in the field of education to discuss their ideas, evaluate proposed questions, and suggest new questions for the survey.

We wish to thank all those who contributed their ideas to this survey.

Research Procedure

The Sample. The sample used in this survey embraced a total of 1,516 adults (18 years of age and older). It is described as a modified probability sample of the United States. Personal, in-home interviewing was conducted in all areas of the U.S. and in all types of communities. A description of the sample can be obtained from Phi Delta Kappa.

Time of Interviewing. The fieldwork for this study was carried out during the period of 18-27 May 1984.

The Report. In the tables that follow, the heading "Nonpublic School Parents" includes parents of students who attend parochial schools and parents of students who attend private or independent schools.

Due allowance must be made for statistical variation, especially in the case of findings for small groups in which relatively few respondents were interviewed, e.g., nonpublic school parents.

The findings of this report apply only to the U.S. as a whole and not to individual communities. Local surveys, using the same questions, can be conducted to determine how local areas compare with national norms.

Summary of Findings

Americans are more favorably disposed toward the public schools today than at any time in the last decade. In this year's survey, more Americans (42%) grade their local schools A or B for their performance than at any time since 1976 — with an 11-point increase just since last year. Virtually the same dramatic increase occurs among the parents of public school children — with a 10% rise since last year in the percentage giving the local schools an A or B rating.

Americans have also become significantly more favorably disposed toward public school teachers and administrators. In 1981, 39% gave teachers a grade of A or B, whereas today the figure is 50%. Moreover, the A or B grades given to principals and administrators have risen from 36% to 47% during this same three-year period.

A final indicator that reveals an increase in favorable feelings toward the schools is the public's increased willingness to pay the price for public education. The percentage of Americans who say that they would be willing to pay more taxes for education has risen from 30% to 41%.

Americans continue to feel that public education contributes more to national strength than either industrial might or military power. More than eight in 10 say that developing the best educational system in the world will be "very important" in determining America's future strength, compared to 70% who favor developing the best industrial production system and only 45% who favor developing the strongest military force.

The American public is divided in its support for the various recommendations proposed in the recently published reports concerning U.S. education. The public strongly favors 1) increasing the amount of schoolwork and homework in both elementary and high school, 2) basing all grade promotions on examinations, and 3) employing nationally standardized tests for high school diplomas. Support for each of these proposals has increased in recent years.

Americans also support, by wide margins, the ideas of career ladders for teachers and state board teacher examinations in every subject. To a lesser degree, the public feels that salaries for teachers are too low; Americans support higher pay for teachers where shortages exist, including mathematics, science, technical subjects, vocational training, and other critical areas.

Americans give top priority to the traditional "basics" — math and English — as has been the case since these annual surveys were initiated; there is virtually unanimous agreement that these courses should be required of all high school students — both college-bound and non-college-bound. Several of the so-called "new basics" (i.e., science and computer science) are considered less important, though both have recorded gains since 1981, particularly computer science. Similarly, vocational training as a requirement for non-college-bound students has registered substantial gains. The issue of foreign language as a requirement for college-bound students, however, has made little progress in recent years. The number of Americans who feel that extracurricular activities are very important to a young person's education has dropped from 45% in 1978 to 31% today.

The public appears to be unwilling to make some of the necessary sacrifices or commitments to help implement some of the recommendations of the school reform reports. Americans are opposed to extended school years or longer school days, which would provide the time for additional schooling. (Support for both ideas has increased somewhat in the last few years, however.) Furthermore, nonparents as well as parents oppose by a 2-1 margin the tougher college admission standards that are the logical extension of stricter standards at the elementary and high school levels.

Although teachers oppose merit pay as a means of rewarding outstanding teaching performance by a margin of roughly 2-1, the public (including parents and nonparents) favors the idea by about 3-1. Among the half of the population who are familiar with merit pay, support rises to roughly 4-1.

Approximately seven Americans in 10 favor school prayer — one of the most controversial issues facing the public schools today. At the same time, though the survey question omitted the word voluntary, a separate Gallup Poll measuring support for voluntary prayer shows some decline in support for the proposal.

Although Americans have tended to favor Ronald Reagan as President over Walter Mondale, they feel that Mondale would be more likely than Reagan — by 42% to 34% — to improve the quality of education. In addition, 65% of Americans say that they would be more likely to vote for a candidate who favored increased federal spending for education; only 22% say that they would be less likely to vote for such a candidate.

The American public continues to regard discipline as the most important problem facing the public schools; about one-fourth of Americans cite discipline as the predominant problem, as they have done for more than a decade. Our analysis indicates that this is probably an outcome of the public's exaggerated perceptions of specific disciplinary problems that occur in the schools — especially when these findings are compared to the testimony of those most likely to know the actual situation, the teachers. Half of the American public feels that drugs are used in the local schools "most of the time" or "fairly often." About one-third of the public feels that theft of money or personal property, drinking of alcoholic beverages, theft of school property, and carrying of knives or other weapons occur "most of the time" or "fairly often."

MONITORING MEASURES

Education in America's Future

The American public is strongly in favor of developing the best educational system in the world. In fact, U.S. citizens believe — as they did in 1982, when this question was first asked — that education will be more important in determining America's place in the world 25 years from now than our industrial system or our military might.

The question:

In determining America's strength in the future — say, 25 years from now — how important do you feel each of the following factors will be — very important, fairly important, not too important, or not at all important?

	Very Important %	Fairly Important %	Not Too Important %	Not At All Important %	Don't Know %
Developing the best educational system in the world	82	13	2	1	2
Developing the most efficient industrial production system in the world	70	23	3	1	3
Building the strongest military force in the world	45	36	13	3	3

	Those responding very important	
	1984 %	1982 %
Developing the best educational system in the world	82	84
Developing the most efficient industrial production system in the world	70	66
Building the strongest military force in the world	45	47

1984 Rating of the Public Schools

The downward trend in the public's rating of the public schools recorded in these surveys during the last decade has ended. This year, 42% of those interviewed gave an A or B rating to the public schools in their communities, up sharply from 31% in 1983. Not since 1976 have these ratings been so high.

The higher rating given the schools this year may have resulted from two developments. First, the reports of the national commissions that have examined schooling in America have caused widespread debate concerning the quality of public education. Citizens have taken a closer look at their own schools and presumably found them better than they had previously believed. Also, many schools have heeded the criticisms made in the reports and have instituted reforms in their educational programs.

It is noteworthy that parents also give their schools a higher rating this year: 52% A or B, as opposed to 42% in 1983.

The question:

Students are often given the grades A,B,C,D, and FAIL to denote the quality of their work. Suppose the public schools themselves, in this community, were graded in the same way. What grade would you give the public schools here — A,B,C,D, or FAIL?

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
A rating	10	8	15	4
B rating	32	31	37	33
C rating	35	35	32	42
D rating	11	10	12	16
FAIL	4	5	3	4
Don't know	8	11	1	1

Ratings Given The Local Public Schools	National Totals								
	1984 %	1983 %	1982 %	1981 %	1980 %	1979 %	1978 %	1977 %	1976 %
A rating	10	6	8	9	10	8	9	11	13
B rating	32	25	29	27	25	26	27	26	29
C rating	35	32	33	34	29	30	30	28	28
D rating	11	13	14	13	12	11	11	11	10
FAIL	4	7	5	7	6	7	8	5	6
Don't know	8	17	11	10	18	18	15	19	14

Further breakdowns:

	A %	B %	C %	D %	FAIL %	Don't Know %
NATIONAL TOTALS	10	32	35	11	4	8
Sex						
Men	9	33	34	11	5	8
Women	10	32	36	11	3	8
Race						
White	10	33	34	11	4	8
Nonwhite	11	26	38	10	6	9
Age						
18 - 29 years	7	27	43	13	5	5
30 - 49 years	10	33	37	11	4	5
50 and over	11	35	27	9	5	13
Community Size						
1 million and over	9	29	37	12	5	8
500,000 - 999,999	5	34	37	16	3	5
50,000 - 499,999	9	29	34	14	6	8
2,500 - 49,999	8	43	31	6	3	9
Under 2,500	13	34	31	7	5	10
Central city	6	27	38	15	7	7
Education						
Grade school	14	27	29	8	5	17
High school	8	33	35	12	5	7
College	10	33	36	12	3	6
Region						
East	9	30	37	13	5	6
Midwest	13	37	30	8	4	8
South	8	35	33	10	5	9
West	9	25	40	14	4	8

Rating of Public Schools Nationally

This year's survey also shows an upward trend in the public's rating of the public schools nationally. But, as the ratings indicate, respondents continue to give schools in their own communities higher marks than they do the public schools nationally.

The question:

How about the public schools in the nation as a whole? What grade would you give the public schools nationally — A,B,C,D, or FAIL?

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
A rating	2	2	3	4
B rating	23	24	21	19
C rating	49	47	52	50
D rating	11	10	13	15
FAIL	4	4	2	4
Don't know	11	13	9	8

	Public Schools in the Nation			
	1984 %	1983 %	1982 %	1981 %
A rating	2	2	2	2
B rating	23	17	20	18
C rating	49	38	44	43
D rating	11	16	15	15
FAIL	4	6	4	6
Don't know	11	21	15	16

Rating of Teachers in the Local Public Schools

The 1984 survey indicates that the public has increasing respect for the teachers in the local schools. Half of all respondents give teachers an A or B rating. This is considerably higher than the rating given to teachers in the 1981 survey.

The highest ratings go to teachers in small communities — those with a population under 2,500. The lowest ratings go to teachers in the central cities, where the teaching problems are greatest.

Respondents living in the Midwest give their teachers a slightly higher rating than do citizens living in other areas of the U.S.

The question:

Now, what grade would you give the teachers in the public schools in this community?

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
A rating	13	13	15	6
B rating	37	35	43	34
C rating	31	31	29	42
D rating	7	6	8	9
FAIL	3	3	3	1
Don't know	9	12	2	8

NATIONAL TOTALS	1984 %	1981 %
A rating	13	11
B rating	37	28
C rating	31	31
D rating	7	9
FAIL	3	6
Don't know	9	15

Further breakdowns:

	A %	B %	C %	D %	FAIL %	Don't Know %
NATIONAL TOTALS	13	37	31	7	3	9
Sex						
Men	12	38	31	7	3	9
Women	14	37	31	6	3	9
Race						
White	13	38	30	7	3	8
Nonwhite	13	33	35	6	3	10
Age						
18 - 29 years	11	33	38	7	4	7
30 - 49 years	12	39	33	6	3	6
50 and over	15	38	24	6	3	14
Community Size						
1 million and over	12	35	35	6	3	9
500,000 - 999,999	17	38	25	10	2	8
50,000 - 499,999	9	37	33	8	2	11
2,500 - 49,999	15	39	27	5	4	10
Under 2,500	17	41	19	5	5	13
Central city	9	34	38	8	3	8
Education						
Grade school	13	35	21	7	6	18
High school	13	34	34	7	4	8
College	13	42	29	7	1	8
Region						
East	11	40	31	6	5	7
Midwest	16	41	27	5	2	9
South	13	34	33	8	2	10
West	11	34	33	8	3	11

Rating of Principals and Administrators in the Local Public Schools

The ratings given to school principals and other administrators are somewhat similar to those given to teachers. As in the case of teachers, the ratings in the 1984 survey are appreciably higher than those in the 1981 survey.

The question:

Now, what grade would you give the principals and administrators in the local public schools in this community?

	National Totals	No Children in School	Public School Parents	Nonpublic School Parents
	%	%	%	%
A rating	13	12	18	8
B rating	34	32	35	42
C rating	28	30	27	27
D rating	8	7	10	13
FAIL	5	5	5	6
Don't know	11	14	4	7

NATIONAL TOTALS	1984	1981
	%	%
A rating	13	15
B rating	34	30
C rating	28	28
D rating	8	12
FAIL	5	6
Don't know	11	15

Rating of the School Board in This Community

This year's survey, for the first time, rates school boards on the same scale as that employed to rate the schools, teachers, administrators, and parents.

Understandably, those who have little contact with the public schools say that they do not know enough about their local school boards to assign a rating. Parents with children now enrolled in either public or nonpublic schools rate school boards only slightly lower than they rate the schools themselves. The highest rating is given by respondents who have children now enrolled in the public schools.

The question:

Now, what grade would you give the school board in this community?

	National Totals	No Children in School	Public School Parents	Nonpublic School Parents
	%	%	%	%
A rating	8	6	11	5
B rating	32	31	33	32
C rating	28	27	29	38
D rating	11	10	14	14
FAIL	6	8	6	5
Don't know	15	17	6	6

Rating Given to Parents of Students in the Public Schools

Parents of children now attending the public schools are not too pleased with the way public school parents are bringing up their children. In fact, they give themselves, collectively, lower marks for the way they are doing their job than they give teachers and school administrators.

Only 35% give parents a grade of A or B. This contrasts with a figure of 58% for teachers and 54% for principals and other school administrators.

Parents with children attending nonpublic schools give parents of public school students even lower grades. Only 29% give public school parents an A or B rating; 29% give them a D or FAIL rating.

The question:

Now, what grade would you give the parents of students in the local public schools for bringing up their children?

	National Totals	No Children in School	Public School Parents	Nonpublic School Parents
	%	%	%	%
A rating	7	6	9	4
B rating	28	25	33	25
C rating	35	35	35	40
D rating	16	16	15	16
FAIL	6	6	5	13
Don't know	8	12	2	5

NATIONAL TOTALS	1984	1981*
	%	%
A rating	7	5
B rating	28	24
C rating	35	36
D rating	16	15
FAIL	6	11
Don't know	8	9

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*The wording of the question in the 1981 survey was: "What grade would you give parents in this community for the job they are doing in raising their children to be self-disciplined and responsible young people — A,B,C,D, or FAIL?"

Tax Increases to Support The Public Schools

Since the spring of 1983, when the National Commission on Excellence in Education presented its report, a slight increase has been registered in the percentage of citizens who favor a tax increase in situations where the schools say that they need much more money.

The percentage of public school parents who favor such a tax increase has risen from 46% in 1983 to 54% today, while the percentage of those opposed has dropped from 46% to 38%.

Those respondents who have attended college are most in favor of tax increases. When sections of the U.S. are compared, residents of the western states are found to be most in favor of raising taxes to help the schools.

The question:

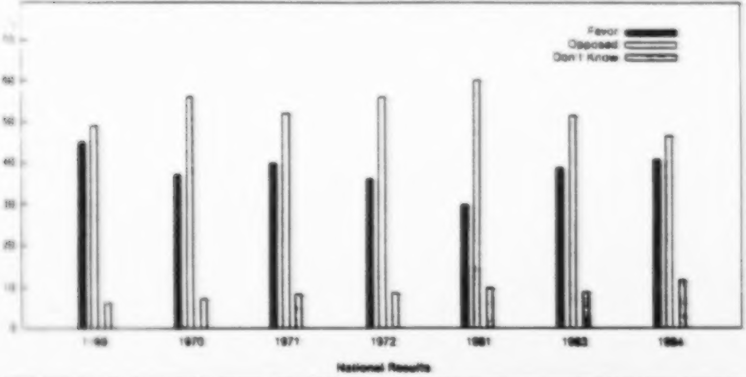
Suppose the local public schools said they needed much more money. As you feel at this time, would you vote to raise taxes for this purpose, or would you vote against raising taxes for this purpose?

	National Totals	No Children in School	Public School Parents	Nonpublic School Parents
	%	%	%	%
For raise in taxes	41	37	54	42
Against raise in taxes	47	50	38	51
Don't know	12	13	8	7

Financial Support of the Public Schools

NATIONAL TOTALS	Favor Raising Taxes	Opposed to Raising Taxes	Don't Know
	%	%	%
1984 survey	41	47	12
1983 survey	39	52	9
1981 survey	30	60	10

Would You Vote to Raise Taxes to Support the Public Schools?



Financial Support of the Public Schools

	Favor Raising Taxes	Opposed to Raising Taxes	Don't Know
NATIONAL TOTALS	%	%	%
1972 survey	36	56	8
1971 survey	40	52	8
1970 survey	37	56	7
1969 survey	45	49	6

CURRENT EDUCATION ISSUES

Presidential Candidate Perceived to Support Education More

At the time interviewing was conducted for this survey, Ronald Reagan held a wide lead in a Presidential trial heat against Walter Mondale (54% to 39%).

Despite this apparent preference for President Reagan, when the public was asked which candidate, Reagan or Mondale, would be more likely to improve the quality of education in the U.S., Mondale was named by a larger percentage than the President — 42% to 34%. Nearly a quarter of the public registered no opinion.

The question:

Which Presidential candidate do you feel would be more likely, as President, to improve the quality of public education in the U.S. — Ronald Reagan or Walter Mondale?

	National Totals
	%
Walter Mondale	42
Ronald Reagan	34
No opinion	24

Likelihood of Voting for Candidate Supporting Increased Spending for Education

Another measure of the public's willingness to spend more on education is elicited by a question asking whether respondents would be more likely to vote for a Presidential candidate who favored increased spending for education or less likely to vote for such a candidate.

Two-thirds of Americans (66%) would be more likely to vote for the candidate supporting increased spending. Only a third as many (22%) say that they would be less likely to vote for this candidate.

The question:

Would you be more likely or less likely to vote for a candidate who says he would increase federal spending for education?

	National Totals
	%
More likely	66
Less likely	22
Don't know	12

Increasing the Length of The School Year

Public sentiment in favor of increasing the length of the school year by one month is growing. In the 1982 survey a total of 37% approved of this plan. In 1983 approval reached 40%, and in the present survey the comparable figure is 44%. However, 50% in this year's survey still oppose this plan.

Those who are most in favor of a longer school year are residents of the cities with populations over one million. Most opposed are people living in smaller cities and in towns of 2,500 and under.

Those who have attended college favor a longer school year by a margin of 51% to 45%. Residents of the western states also approve a longer school year by a margin of 59% to 38%.

The question:

In some nations, students attend school as many as 240 days a year as compared to 180 days in the U.S. How do you feel about extending the

Chart by Charmaine Dupree

public school year in this community by 30 days, making the school year about 210 days or 10 months long? Do you favor or oppose this idea?

	National Totals	No Children in School	Public School Parents	Nonpublic School Parents
	%	%	%	%
Favor	44	44	45	45
Oppose	50	49	50	49
No opinion	6	7	5	6

	1984	1983	1982
NATIONAL TOTALS	%	%	%
Favor	44	40	37
Oppose	50	49	53
No opinion	6	11	10

Further breakdowns:

	Favor	Oppose	No Opinion
	%	%	%
NATIONAL TOTALS	44	50	6
Sex			
Men	[illegible]	[illegible]	[illegible]
Women	[illegible]	[illegible]	7
Race			
White	[illegible]	[illegible]	[illegible]
Nonwhite	[illegible]	[illegible]	[illegible]
Age			
18 - 29 years	[illegible]	[illegible]	[illegible]
30 - 49 years	[illegible]	[illegible]	[illegible]
50 and over	[illegible]	[illegible]	[illegible]
Community Size			
1 million and over	[illegible]	[illegible]	[illegible]
500,000 - 999,999	[illegible]	[illegible]	[illegible]
50,000 - 499,999	[illegible]	[illegible]	[illegible]
2,500 - 49,999	[illegible]	[illegible]	[illegible]
Under 2,500	[illegible]	[illegible]	[illegible]
Central city	[illegible]	[illegible]	[illegible]
Education			
Grade school	[illegible]	[illegible]	13
High school	[illegible]	[illegible]	[illegible]
College	[illegible]	[illegible]	[illegible]
Region			
East	[illegible]	[illegible]	[illegible]
Midwest	[illegible]	[illegible]	[illegible]
South	[illegible]	[illegible]	[illegible]
West	[illegible]	[illegible]	[illegible]

Extending the School Day by One Hour

Although this year's survey findings indicate that the public is slightly more in favor of increasing the length of the school day by one hour than in 1982, a majority remain opposed.

Residents of the western states and the largest cities most strongly favor the longer school day. Residents of the Midwest are the most opposed.

The question:

How do you feel about extending the school day in the schools in this community by one hour? Do you favor or oppose this idea?

	National Totals	No Children in School	Public School Parents	Nonpublic School Parents
	%	%	%	%
Favor	42	42	41	50
Oppose	52	51	56	46
No opinion	6	7	3	4

	1984	1983	1982
NATIONAL TOTALS	%	%	%
Favor	42	41	37
Oppose	52	48	55
No opinion	6	11	8

Further breakdowns:

	Favor	Oppose	No Opinion
	%	%	%
NATIONAL TOTALS	42	52	6
Sex			
Men	[illegible]	[illegible]	[illegible]
Women	[illegible]	[illegible]	[illegible]
Race			
White	[illegible]	[illegible]	[illegible]
Nonwhite	[illegible]	[illegible]	[illegible]
Age			
18 - 29 years	[illegible]	[illegible]	[illegible]
30 - 49 years	[illegible]	[illegible]	[illegible]
50 and over	[illegible]	[illegible]	[illegible]
Community Size			
1 million and over	[illegible]	[illegible]	[illegible]
500,000 - 999,999	[illegible]	[illegible]	[illegible]
50,000 - 499,999	[illegible]	[illegible]	[illegible]
2,500 - 49,999	[illegible]	[illegible]	[illegible]
Under 2,500	[illegible]	[illegible]	[illegible]
Central city	[illegible]	[illegible]	[illegible]
Education			
Grade school	[illegible]	[illegible]	[illegible]
High school	[illegible]	[illegible]	[illegible]
College	[illegible]	[illegible]	[illegible]
Region			
East	[illegible]	[illegible]	[illegible]
Midwest	[illegible]	[illegible]	[illegible]
South	[illegible]	[illegible]	[illegible]
West	[illegible]	[illegible]	[illegible]

Amount of Schoolwork Required of Elementary and High School Students

All segments of the U.S. population agree that students in elementary schools and high schools are not made to work hard enough in school or on homework. This opinion has remained fairly constant in three surveys, the first in 1978.

Only 5% of those interviewed in this year's survey think that students are made to work too hard in elementary school, and only 4% think students in high school are made to work too hard. By contrast, 56% say that students are not required to work hard enough in elementary school, and 67% say that they are not required to work hard enough in high school.

Perhaps the best judges of whether students are being given enough schoolwork to do in school and at home are the parents of these students. Parents agree that their children are not being required to work hard enough. Only 7% of parents with children now enrolled in the public schools say that children in elementary school are required to work too hard; 54% say that they are not required to work hard enough. In the case of high school students, 5% of parents with children enrolled in public schools say that children are required to work too hard; 62% say that they are not required to work hard enough.

The question:

In general, do you think elementary schoolchildren in the public schools here are made to work too hard in school and on homework or not hard enough?

	National Totals	No Children In School	Public School Parents	Nonpublic School Parents
	%	%	%	%
Too hard	5	5	7	4
Not hard enough	39	35	34	39
About right amount	44	44	54	38
Don't know	12	16	5	19

NATIONAL TOTALS	1984 %	1983 %	1979 %
Too hard	5	4	5
Not hard enough	39	31	43
About right amount	44	46	33
Don't know	12	19	19

The question:

What about students in the public high schools here — in general, are they required to work too hard or not hard enough?

	National Totals	No Children In School	Public School Parents	Nonpublic School Parents
	%	%	%	%
Too hard	4	4	3	*
Not hard enough	67	68	62	69
About right amount	18	15	28	22
Don't know	11	13	8	9

NATIONAL TOTALS	1984 %	1983 %	1979 %
Too hard	4	3	3
Not hard enough	67	65	54
About right amount	18	12	22
Don't know	11	20	21

Subjects the Public Would Require

Mathematics and English head the list of subjects the public would require of high school students who plan to attend college; mathematics was mentioned by 88% of respondents, and English was mentioned by 84%.

In addition, a large majority would require history/U.S. government and science. Slightly fewer, but still a majority, would require courses in business, foreign language, and health education.

For non-college-bound students, the public would also require math and English and by virtually the same percentages as for those planning to go to college. Somewhat fewer respondents feel that history and science should be required of non-college-bound students, and far fewer favor a foreign language requirement.

Not surprisingly, a much larger percentage of Americans feel that vocational training should be required for non-college-bound students than for those planning to go to college. Similarly, business as a required course is favored by a slightly larger percentage for non-college-bound students.

Support for computer science as a required course — for both college- and non-college-bound students — has dramatically increased from 43% to 68% in just three years. Although support for a science requirement for non-college-bound students has risen only marginally, support for a science requirement for those planning to go to college has risen from 76% to 84% since 1981. On the other hand, support for a foreign language for college-bound students has made little progress in the past three years.

The questions:

Would you look over this card, which lists high school subjects. If you were the one to decide, what subjects would you require every public high school student who plans to go on to college to take?

What about those public high school students who do not plan to go to college when they graduate? Which courses would you require them to take?

	Should Be Required: For Those Planning To Go to College	Should Be Required: For Those Not Planning to Go To College
	%	%
Mathematics	88	85
English	84	83
History/U.S. government	84	71
Science	84	61
Business	68	75
Foreign language	57	15
Health education	52	50
Physical education	43	44
Vocational training	37	83
Art	24	15
Music	22	16

	Should Be Required: For Those Planning To Go to College			Should Be Required: For Those Not Planning to Go To College		
	1984	1983	1981	1984	1983	1981
	%	%	%	%	%	%
Mathematics	88	92	94	85	87	91
English	84	88	91	83	85	89
History/U.S. government	84	78	83	71	65	71
Science	84	76	76	61	58	58
Business	68	55	60	75	65	75
Foreign language	57	50	54	16	15	21
Health education	52	43	47	52	42	46
Physical education	43	41	44	44	40	43
Vocational training	37	32	34	83	74	64
Art	24	16	28	18	18	20
Music	22	16	26	16	16	20

Special Areas of Instruction That Should Be Required

The public would like the public schools to provide instruction in many aspects of [illegible] in addition to the subjects traditionally [illegible] curriculum. Heading the list of these special areas of instruction is drug abuse, followed by alcohol abuse. Large majorities of the population would also require instruction in such areas as driver education, computer training, race relations, and the dangers of nuclear waste.

The question:

In addition to regular courses, high schools offer instruction in other areas. As I read off these areas, one at a time, would you tell me whether you feel this instruction should be required or should not be required for all high school students.

	Should Be Required	Should Not Be Required	No Opinion
	%	%	%
Drug abuse	82	13	5
Alcohol abuse	79	16	5

	Should Be Required	Should Not Be Required	No Opinion
	%	%	%
Driver education	73	23	4
Computer training	68	28	4
Race relations	66	28	6
Dangers of nuclear waste	61	34	5
Communism/socialism	57	37	6
Parenting/parenthood training	56	38	6
Dangers of nuclear war	51	43	6

	Should Be Required		
	1984	1983	1981
	%	%	%
Drug abuse	82	81	80
Alcohol abuse	79	75	76
Driver education	73	72	71
Computer training	68	72	43
Race relations*	66	58	–
Dangers of nuclear waste*	61	58	–
Communism/socialism*	57	51	–
Parenting/parenthood training	56	58	54
Dangers of nuclear war*	51	45	–

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*These topics were not included in the 1981 survey.

Importance of Extracurricular Activities

About three-quarters of the U.S. public (77%) feel that extracurricular activities are either "very important" or "fairly important" to a young person's education. At the same time, however, there has been a decline in the percentage of those who say that extracurricular activities are "very important" — from 45% in 1978 to 31% in 1984. During this same period there has been an increase in the percentage of the public who say that extracurricular activities are "not too important" — from 9% to 16%. This decrease in support may reflect, to some extent, the heavy emphasis placed on the academic curriculum by the various national reports on the state of education.

Better-educated Americans are more inclined to feel that extracurricular activities are important. A total of 84% of those who have attended college say that these activities are "very important" or "fairly important," while only 66% of those whose education ended with grade school regard such activities as important.

The question:

I'd like your opinion about extracurricular activities such as the school band, dramatics, sports, and the school paper. How important are these to a young person's education — very important, fairly important, not too important, or not at all important?

	National Totals	No Children in School	Public School Parents	Nonpublic School Parents
	%	%	%	%
Very important	31	31	32	30
Fairly important	46	45	48	52
Not too important	16	16	15	14
Not at all important	4	4	3	3
No opinion	3	4	2	1

NATIONAL TOTALS	1984	1978
	%	%
Very important	31	45
Fairly important	46	40
Not too important	16	9
Not at all important	4	4
No opinion	3	2

National Test for Graduation

The American public shows remarkable unanimity in favoring a standard nationwide test for graduation from high school. Only in communities under 2,500 is sentiment fairly closely divided on this proposal.

This question was first asked of a national cross section of adults in 1958, and the idea was favored at that time by a margin of 50% to 39%. When the same question was asked in 1981, 65% favored the proposal, 30% opposed it, and 5% had no opinion. Roughly the same results were found in this year's survey: 65% in favor, 29% opposed, and 6% with no opinion.

Many nations require students to pass standard examinations for graduation; in the United States, however, because of varying local conditions, such a plan has never been adopted. Nevertheless, the public appears to see merit in such a policy.

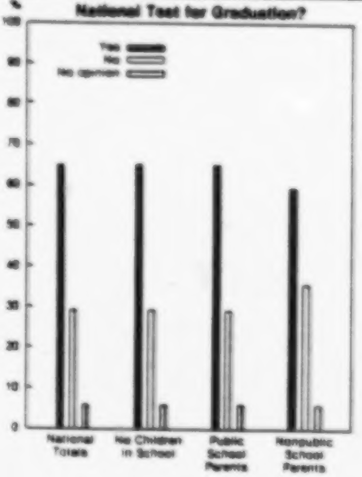
The question:

Should all high school students in the United States be required to pass a standard nationwide examination in order to get a high school diploma?

	National Totals	No Children in School	Public School Parents	Nonpublic School Parents
	%	%	%	%
Yes	65	65	64	59
No	29	29	30	35
No opinion	6	6	6	6

NATIONAL TOTALS	1984	1981	1977	1958
	%	%	%	%
Yes	65	65	65	50
No	29	30	31	39
No opinion	6	5	4	11

National Test for Graduation?



Raising College Entrance Requirements

Many educators have argued that raising the entrance requirements of colleges and universities would be an effective way of inducing the public schools to raise their standards. However, this proposal fails to win the approval of the public.

Analysis of the opinions of various groups in the population reveals that all major groups oppose this suggestion, especially those most concerned: parents of children now attending elementary or high school. Even those who have attended college vote against the idea.

The question:

Do you feel that four-year colleges and universities should raise their entrance requirements or not?

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
Yes	27	28	26	21
No	59	57	64	61
No opinion	14	15	10	18

State Board Examinations for Teachers

Survey findings reveal widespread agreement that prospective teachers should be required to pass state board examinations to prove their knowledge in the subjects they plan to teach.

More than eight in every 10 respondents have favored this policy in the three surveys in which this same question has been asked: 1979, 1981, and 1984.

The question:

In addition to meeting college requirements for a teacher's certificate, should those who want to become teachers also be required to pass a state board examination to prove their knowledge in the subjects they will teach before they are hired?

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
Yes	89	89	90	87
No	7	7	5	7
No opinion	4	4	5	6

NATIONAL TOTALS	1984 %	1981 %	1979 %
Yes	89	84	85
No	7	11	9
No opinion	4	5	6

Career Ladder for Teachers

The proposal to adopt a career ladder for public school teachers that is grounded in classroom effectiveness, with accompanying salary increases, is favored by a substantial majority (73%) of the public. In fact, by approximately the same percentages, all segments of the population agree that this is a good plan.

The question:

It has been suggested that public schools adopt a career ladder for teachers, based primarily upon demonstrated effectiveness in the classroom, with salaries increasing accordingly. Would you approve or disapprove if such a plan were adopted by the public schools in this community?

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
Approve	73	70	77	73
Disapprove	18	18	16	19
No opinion	9	12	7	8

Teachers' Salaries in This Community

The American public tends to feel that teachers' salaries are too low. Interestingly, this view is held by those who do not have children enrolled in the public schools, as well as by those who do.

On the other hand, those who have no children in the local schools are more likely to vote against tax increases and bond issues for the schools than those who have children enrolled.

During the last 15 years, attitudes concerning teachers' salaries have shown little change. The weight of opinion throughout this period has been that salaries are too low. This opinion is particularly prevalent among more highly educated citizens and among those who live in the southern states, where teacher salaries tend to be lowest.

The question:

Do you think salaries in this community for teachers are too high, too low, or just about right?

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
Too high	7	6	8	7
Too low	37	37	38	38
Just about right	41	40	41	42
No opinion	15	17	13	13

NATIONAL TOTALS	[illegible] %	[illegible] %	[illegible] %	[illegible] %
Too high	7	6	10	2
Too low	37	35	29	33
About right	41	31	41	43
No opinion	15	28	20	22

NATIONAL TOTALS [illegible]	[illegible] %	[illegible] %	[illegible] %	[illegible] %
Too high	[illegible]	[illegible]	[illegible]	[illegible]
Too low	[illegible]	[illegible]	[illegible]	[illegible]
About right	[illegible]	[illegible]	[illegible]	[illegible]

Paying Math and Science Teachers More

Slightly more respondents in this year's survey favor than oppose paying higher wages to teachers of science, math, and technical and vocational subjects because of the shortage that now exists in these subject areas. However, only in the largest cities does the percentage reach 50% or higher.

When the same question was asked in 1983, national totals were 50% in favor, 35% opposed, and 15% don't know.

The question:

Today there is a shortage of teachers in science, math, technical subjects, and vocational subjects. If your local schools needed teachers in these subjects, would you favor or oppose paying them higher wages than teachers of other subjects?

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
Favor	48	46	50	[illegible]
Oppose	43	43	42	[illegible]
No opinion	9	11	8	[illegible]

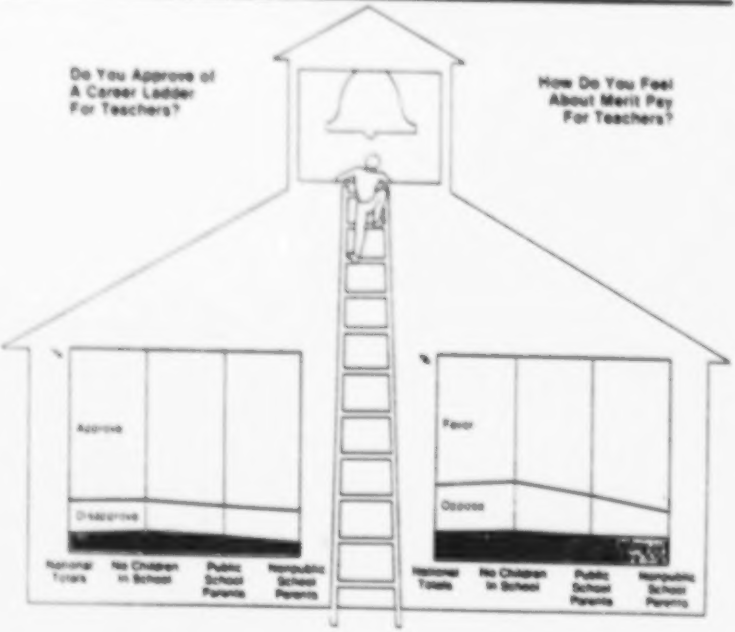
NATIONAL TOTALS	1984 %	1983 %
Favor	48	50
Oppose	43	35
No opinion	9	15

Attitudes Toward Merit Pay Programs

Although the issue of merit pay for teachers seems to have provoked a great deal of discussion recently, when this survey was conducted only half of those interviewed said that they had heard or read anything about such programs.

When those who said that they were aware of merit pay proposals were asked whether they generally favored or opposed the idea, three-fourths (76%) said that they approved of it, 19% were opposed, and 5% had no opinion. For the total sample, the percentage who approve of the idea of merit pay is 65%, with 22% opposed and 13% having no opinion.

In 1970 and again in 1983 a merit pay question was asked in this form: "Should each teacher be paid on the basis of the quality of his or her work, or should all teachers be paid on a standard-scale basis?" In 1970, 58% said that teachers should be paid according to "quality of work," 36% on a "standard scale," and 6% said "don't know." Comparable figures for '83 were 61%, 31%, and 8%.



The question:

Some states have recently adopted merit pay programs which would provide additional pay for outstanding teacher performance. Have you heard or read anything about these programs?

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
Yes	51	50	55	56
No	45	46	42	42
Don't know	4	4	3	2

The question:

How do you, yourself, feel about the idea of merit pay for teachers? In general, do you favor or oppose it?

Total Sample	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
Favor	65	63	69	75
Oppose	22	23	20	14
No opinion	13	14	11	11

Those Who Have Heard or Read About Merit Pay for Teachers	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
Favor	76	75	77	81
Oppose	19	20	19	10
No opinion	5	5	4	9

Criteria to Be Used in Awarding Merit Pay

One of the greatest hurdles facing merit pay is the difficulty of agreeing on the criteria to be used in deciding which teachers should receive extra pay. A list of possible criteria was compiled. To determine which criteria are most acceptable to the public, respondents were asked in the case of each criterion whether they thought it should or should not be used to decide which teachers should be given additional pay.

Seven criteria are listed below in order of their acceptability to the public. Improvement achieved by students as measured by standardized tests is rated highest. Virtually the same rating is given to the evaluations of administrators. Gaining almost the same high approval is an advanced degree, such as the master's or Ph.D. Evaluation by other teachers, length of teaching experience, students' evaluations, and parents' opinions have support, but not majority support.

The question:

This card lists possible criteria for giving additional pay to teachers for special merit. As I read off each one by letter, please tell me if you think it should or should not be used to determine which teachers should receive merit pay.

	Should Be Criterion %	Should Not Be Criterion %	No Opinion %
Academic achievement or improvement of students (as measured by standardized tests)	68	25	7
Administrators' evaluations	67	26	7
An advanced degree, such as a master's or Ph.D.	66	27	7
Evaluation by other teachers in the system	48	42	10
Length of teaching experience	46	47	7
Students' evaluations	45	47	8
Parents' opinions	38	53	9

Teaching as a Career

Although teaching as a career has lost favor steadily during the last 15 years, the results from this year's survey indicate that the downward trend may have ended. In 1969, 75% of parents said that they would like to see one of their children enter public school teaching as a career. In 1983 only 45% said this.

In the 1984 survey, the question differed from that asked in 1969 and 1983, which dealt with "a child of yours." The question this year asked respondents first if they would like a daughter to take up teaching as a career; the same question was then asked about a son.

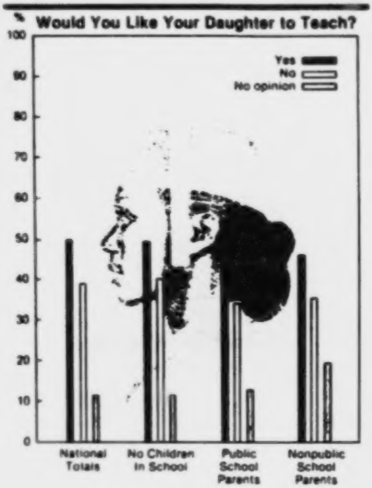
Fully 50% of those interviewed said that they would like a daughter of theirs to take up teaching in the public schools as a career. Slightly fewer (46%) said that they would like a son of theirs to make a career of teaching.

The question:

Would you like to have a daughter of yours take up teaching in the public schools as a career?

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
Yes	50	49	54	46
No	39	40	34	35
No opinion	11	11	12	19

Would You Like Your Daughter to Teach?



The question:

Would you like to have a son of yours take up teaching in the public schools as a career?

	National Totals	No Children In School	Public School Parents	Nonpublic School Parents
	%	%	%	%
Yes	45	45	51	41
No	43	43	37	49
No opinion	12	12	12	10

	Daughter		Son	
NATIONAL TOTALS	1984	1980	1984	1980
	%	%	%	%
Yes	60	48	45	43
No	29	42	43	47
Don't know	11	10	12	10

Prayer in the Public Schools

Prayer in the public schools is an issue that has been hotly debated in recent years. A majority of those interviewed in this year's survey favor a constitutional amendment that would allow school prayer. However, the least support for such an amendment is found among the best-educated citizens and among the youngest adult age group — and these two groups will play the greatest role in determining future trends in public attitudes.

The question:

Have you heard or read about a proposed Amendment to the U.S. Constitution that would allow prayer in the public schools?

	National Totals	No Children In School	Public School Parents	Nonpublic School Parents
	%	%	%	%
Yes	93	93	95	93
No	6	7	4	7
Not sure	1	*	1	—

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*Less than one-half of 1%.

The question:

Do you favor or oppose this proposed Amendment?

Those Aware of Amendment	National Totals	No Children In School	Public School Parents	Nonpublic School Parents
	%	%	%	%
Favor	69	68	73	68
Oppose	24	25	21	21
Don't know	7	7	6	11

The question:

How strongly do you favor/oppose this Amendment — very strongly, fairly strongly, or not at all strongly?

Those Who Favor the Amendment	National Totals
	%
Very strongly	61
Fairly strongly	34
Not at all strongly	5
Can't say	*

Those Who Oppose the Amendment	National Totals
	%
Very strongly	48
Fairly strongly	39
Not at all strongly	12
Can't say	1

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*Less than one-half of 1%.

Nongraded Schools

The idea that a student should be allowed to progress through the school system at his or her own speed and without regard to grade level wins majority support, though acceptance of this plan by the public is less than in earlier surveys.

The nongraded concept is more popular with better-educated citizens, with younger citizens, and with parents of children in nonpublic schools. It is most popular in the large cities and least popular in the small communities of the U.S.

The question:

Should a student be able to progress through the school system at his own speed and without regard to the usual grade level? This would mean that he might study seventh-grade math, but only fifth-grade English. Would you favor or oppose such a plan in the local schools?

	National Totals	No Children In School	Public School Parents	Nonpublic School Parents
	%	%	%	%
Favor	54	51	58	63
Oppose	39	43	36	33
No opinion	7	6	6	4

NATIONAL TOTALS	1984	1980	1975	1972
	%	%	%	%
Favor	54	62	64	71
Oppose	39	30	28	22
No opinion	7	8	8	7

Course Credit for Community Service

Widespread approval is found for a proposal to award course credit to high school juniors and seniors for community service, such as working in a hospital or recreation center, beautifying parks, or helping law enforcement officers.

This proposal was first included in this survey series in 1978. At that time, 87% said that they would like such a plan to be adopted in their own community. In this year's survey, 79% approve of this plan. However, the approval rating among parents of children now attending the public schools remains about the same (86%) as in the earlier survey.

Every group in the population gives a high approval rating to this proposal, which was strongly endorsed in Ernest Boyer's 1983 report, *High School*, an important study by the Carnegie Foundation for the Advancement of Teaching.

The question:

A plan has been suggested to enable all juniors and seniors in high school to perform some kind of community service for course credit — such as working in a hospital or recreation center, beauti-

fying parks, or helping law enforcement officers. Would you like to have such a plan adopted in this community, or not?

	National Totals %	No Children in School %	Public School Parents %	Nonpublic School Parents %
Yes, would like plan	79	77	85	79
No, would not	16	17	12	16
No opinion	5	6	3	5

NATIONAL TOTALS	1984 %	1979 %
Yes, would like plan	79	87
No, would not	15	8
No opinion	6	5

PERENNIAL ISSUES

Major Problems Confronting the Public Schools in 1984

Although discipline continues to be cited most frequently by respondents as the top problem with which their local schools must contend, parents who now have children enrolled in the public schools mention this problem significantly less often than in 1983.

In the 1983 survey, 29% of the parents interviewed named "discipline" as the biggest problem of their schools; 23% mentioned discipline in this year's survey. Since parents of children now in school are likely to be best informed about discipline, their views must be given special credence.

The top five problems found in the 1983 study are also the top five problems cited in 1984. Next to discipline, "use of drugs" and "poor curriculum/poor standards" are mentioned most often. Tied for fourth place are "lack of proper financial support" and "difficulty getting good teachers."

The question:

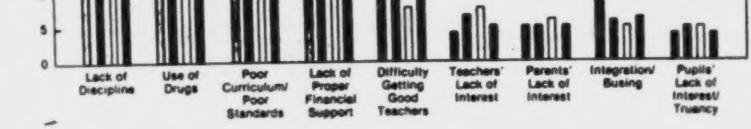
What do you think are the biggest problems with which the public schools in this community must deal?

	National Totals %	No Children in School %	Public School Parents %	Nonpublic School Parents %
Lack of discipline	27	28	23	35
Use of drugs	18	18	20	10
Poor curriculum/poor standards	15	16	14	18
Lack of proper financial support	14	12	17	13
Difficulty getting good teachers	14	13	15	13
Integration/busing	6	.7	3	4
Teachers' lack of interest	5	4	6	7
Parents' lack of interest	5	5	6	7
Low teacher salaries	4	3	6	8
Pupils' lack of interest/truancy	4	4	4	4
Drinking/alcoholism	4	3	5	5
Large schools/overcrowding	4	3	4	6
Lack of respect for teachers/other students	3	3	4	2
Problems with administration	3	3	3	4
Crime/vandalism	3	3	2	2
Mismanagement of funds	2	1	2	5
Lack of proper facilities	2	2	1	1
Moral standards	1	1	2	2
Teachers' strikes	1	1	1	2
Communication problems	1	1	2	1
Parental involvement with school activities	1	*	1	1
Lack of needed teachers	1	1	1	–
Fighting	1	*	2	–
Government interference	1	1	1	1
There are no problems	1	1	2	1
Miscellaneous	4	4	5	7
Don't know/no answer	10	12	4	8

(Figures add to more than 100% because of multiple answers.)

*Less than one-half of 1%.

Biggest Problems Confronting the Public Schools



The Public's Perceptions About Discipline

One way to measure attitudes regarding discipline is to ask respondents how serious a problem discipline is in their schools. Not surprisingly, those most closely connected with schools — the parents of students — hold different views from non-parents about discipline and about many other problems with which the local schools must deal. Thus 29% of parents with children enrolled in the public schools say that the discipline problem is "very serious." In answer to the same question, 38% of those who have no children in the public schools say that the discipline problem is "very serious."

The question:

> **How serious a problem would you say discipline is in the public schools in this community — very serious, fairly serious, not too serious, or not at all serious?**

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
Very serious	34	38	29	32
Fairly serious	34	34	35	38
Not too serious	22	16	28	25
Not at all serious	4	3	6	3
No opinion	6	9	1	2

One of the perennial problems facing the public schools concerns public relations. The media are prone to limit their coverage of news of the schools to what journalists describe as "spot" news — happenings or events that take place in the schools. Unfortunately, these stories usually concern vandalism, drugs, absenteeism, theft of school property, attacks on teachers, and the like. "Good news" is difficult to find and to report.

Consequently, the public receives a distorted picture of schools and tends to regard them as blackboard jungles. Evidence of this comes from a question that asked respondents to estimate how often certain disciplinary problems occur in their local schools.

Analysis reveals that the perception of schools as blackboard jungles is likely to result from an exaggerated idea of the specific disciplinary problems that occur in a school system; this is certainly true when the perceptions of the public are compared with those of teachers, who are most likely to know the actual situation.

For example, as many of half of the respondents in this year's survey feel that drugs are used in their local schools "most of the time" or "fairly often." Similarly, about one-third of the public feel that theft of money or personal property, drinking of alcoholic beverages, theft of school property, and carrying of knives or other weapons occur "most of the time" or "fairly often."

The question:

> **As I read off the following problems by letter, would you tell me how often you think each problem occurs in the public schools in this community — just your impression?**

NATIONAL TOTALS	Most of the Time or Fairly Often %	Not Very Often or Almost Never Never %	Don't Know %
Schoolwork and homework assignments not completed	64	23	13
Behavior that disrupts class	60	29	11
Skipping classes	56	31	13
Talking back to/disobeying teachers	56	32	12
Truancy/being absent from school	53	36	11
Use of drugs at school	53	33	14
Selling of drugs at school	47	37	16
Sloppy or inappropriate dress	47	42	11
Cheating on tests	46	38	16
Vandalizing of school property	38	50	12
Stealing money or personal property belonging to other students, teachers, or staff	35	49	16
Drinking alcoholic beverages at school	35	50	15
Theft of school property	34	51	15
Carrying of knives, firearms, or other weapons at school	28	56	16
Sexual activity at school	24	57	19
Racial fights between whites, blacks, Hispanics, or other minorities	22	64	14
Taking money or property by force, using weapons or threats	16	68	16
Physical attacks on teachers or staff	15	71	14

The Goals of Education

The goals of education are difficult to separate from the goals of life. It is equally difficult to separate the responsibility of the schools for reaching these goals from that of other institutions in American life.

Nevertheless, this year's survey attempted to obtain some evidence of how the public rates the importance of many suggested goals. The ratings given to the goals listed reveal a pragmatic people who view education primarily as a means to economic success rather than to intellectual development. Near the bottom of the list is the goal of appreciation of the arts and letters, learning as a lifetime program, and participation in the democratic process.

The goals are listed below on the basis of the number of respondents who gave a "10" (the highest rating) to the goal in question.

The question:

> **I am going to read a list of possible goals of education. I would like you to rate the importance of each goal on a scale of zero to 10. A zero means a goal is not at all important and should not be part of the public school program. A 10 means a goal is the most important goal — before all others. A rating between zero and 10 means you consider the goal to be somewhere in between in importance.**

	Highest Rating			
	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
To develop the ability to speak and write correctly	68	66	74	71
To develop standards of what is "right" and "wrong"	64	63	68	61

	Highest Rating			
	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
To develop an understanding about different kinds of jobs and careers, including their requirements and rewards	56	54	60	54
To develop skills needed to get jobs for those not planning to go to college	54	52	58	61
To develop the ability to use mathematics for everyday problems	54	52	56	60
To encourage respect for law and order, for obeying the rules of society	52	52	54	53
To help students make realistic plans for what they will do after high school graduation	52	50	56	43
To develop the ability to live in a complex and changing world	51	50	57	42
To develop the desire to excel	51	48	56	51
To develop the ability to think — creatively, objectively, analytically	51	49	55	58
To help develop good work habits, the ability to organize one's thoughts, the ability to concentrate	48	46	52	42
To prepare for college those who plan to attend college	48	43	53	57
To develop the ability to deal with adult responsibilities and problems, i.e., sex, marriage, parenting, personal finances, alcohol and drug abuse	46	44	48	43
To gain an understanding of science and technology	45	43	50	51
To help students get good/high-paying jobs	45	43	51	43
To help students overcome personal problems	45	42	51	48
To develop the ability to understand and use computers	43	41	47	51
To develop the ability to get along with different kinds of people	43	43	43	40
To gain knowledge about the world of today and yesterday (history, geography, civics)	42	40	46	39
To encourage the desire to continue learning throughout one's life	41	40	45	39
To develop respect for and understanding of other races, religions, nations, and cultures	39	39	39	39
To develop an appreciation for and participation in the arts, music, literature, theater, etc.	35	33	39	37
To develop an understanding of democracy and to promote participation in the political process	33	32	35	32

	Highest Rating			
	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
To develop an appreciation of the "good" things in life	32	33	32	34
To promote physical development through sports programs	20	19	23	19

Who Should Determine the Curriculum?

If the public were given the right to decide who should have the greatest influence in deciding what is taught in the public schools, the top choices would be the local school board and parents; the public would give the state government and the federal government relatively little say in this matter.

This view is in sharp contrast to the policies followed in most nations, where the national government typically sets the curriculum.

The question:

In your opinion, who should have the greatest influence in deciding what is taught in the public schools here — the federal government, the state government, the local school board, local public school teachers, or parents of public school children?

	National Totals %	No Children In School %	Public School Parents %	Nonpublic School Parents %
Local school board	27	29	25	29
Parents	24	22	30	23
State government	17	18	14	16
Teachers	11	11	11	12
Federal government	9	9	9	4
Don't know	12	11	11	16

Deletions

The larger number of questions in this year's poll prevented us from publishing further breakdowns for many questions, as well as responses to one question regarding automatic promotion. (Asked if children should be promoted from grade to grade *only* if they can pass examinations, 71% said yes, 25% said no, and 4% expressed no opinion.)

How to Order Reprints

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In October Phi Delta Kappa will publish a 15-year (1969-1984) compilation of the Gallup polls on education. In this volume the poll questions are arranged topically rather than chronologically, making it easier to look up poll results on specific topics. *The Gallup Polls of Attitudes Toward Education, 1969-1984: A Topical Summary* can be ordered for $6 each ($5 for PDK members).

Orders for reprints or for the book should be addressed to Phi Delta Kappa, P.O. Box 789, Bloomington, IN 47402. Ph. 812/339-1156.

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The Failure of High Schools and the Progress of Education

For many Americans, the verdict is in: the high schools are failing. Americans are better educated and have higher standards of living than ever, but popular magazines and academic journals attack the decline of academic standards. Public schools have made considerable progress toward equality for students from poor or minority backgrounds in recent decades, yet newspapers feature stories about student disobedience and violence.[1] More high-school students than ever are working, yet educators fret about the "weakening connection" between school and work. For many, the evidence is convincing. In the sixties we worried chiefly about elementary schools and concentrated most improvement efforts there. Toward the end of the decade the problems of adolescence began to claim more attention, and within a few years collective attention seemed riveted on the disobedience of teenagers and the disasters in their schools. Since then the news has been steadily bad.

The high schools *are* a paradox, yet there has been little debate about the diagnosis of failure. There has, however, been considerable dispute about what caused the problems. Among the most popular explanations are a decline in the quality of teaching, the growth of an anti-intellectual "youth culture," the replacement of reading by viewing, and the daily curriculum of explicit sex, violence, and insubordination offered by television and movies. The decline of the family, for several centuries Americans' favorite explanation for whatever ails them, is also high on the list. Each of these accounts has something to recommend it, but each evokes a time when things generally did work well.[2] The satisfactions of this belief about the past seem to be a partial compensation for the sense that our time is out of joint.

Appealing as these explanations may be, we prefer a contrary notion—namely, that the problems we see now are in good measure the result of past educational successes. Perhaps the most signal success of American public education has been providing nearly equal access to elementary and secondary school for all, an achievement quite distinct in human history. The high schools have been charged with providing equal education since early in this century, but for a long time students from the working class and from minority groups stayed away in disproportionately large numbers. As a result, high schools remained a special institution for many decades—special, because although they were open to the public and thus in some sense egalitarian, their enrollment was drawn heavily from those most willing and able to use the education provided.

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This special quality had a considerable impact on the importance attributed to high-school education and to the seriousness with which all concerned treated it. In a sense, the public high school was not yet fully public. But high-school attendance grew during the century; by the 1960s nearly everyone of suitable age was enrolled in secondary school, and by the late 1970s roughly three out of every four were graduating.

As a result of these enrollment changes, the high schools have become much more fully public. And that has made them seem much less special in Americans' eyes, and much more problematic. In addition, the high schools have made adjustments in organization, curriculum, and standards to accommodate an increasingly diverse student population. One effect of these adjustments has been to make high-school education seem poorer, or less serious, or both.[3] Indeed, once high schools moved decisively toward universal attendance, Americans not only lost the sense that public high schools were a special, desirable institution, but they began also to view the high schools as a social problem, and began searching for more or better education elsewhere. In America, equality is at once an achievement to be celebrated and a degradation to be avoided.

This essay considers the current high-school problem by developing these ideas about secondary education. Our major theme concerns the paradoxes of educational equality in a competitive society. To explore this theme, we attempt a historical analysis of equality and inequality in U.S. secondary education. Our minor theme concerns the nature of social problem-solving, in education or elsewhere, and particularly the ways in which current problems are connected to past problem-solving efforts. The problems we see in secondary education today, for example, occur in high schools that have virtually universal attendance. Because social and economic inequalities in secondary attendance have been very sharply reduced, it is now easier to see the many problems of providing equal education for students from neglected or rejected segments of society. Yet we see these problems in high schools that were organized to solve other problems, and that worked in part because many of the potentially most difficult students did not attend. In present problem-solving we come to grips with the possibilities and limits of past efforts.[4] We can imagine these accumulated results as a sort of social geology, a layered configuration of ideas and institutions that limit what those living in any present can see—or do. Reform is always shaped, and often crippled, by the fruits of past problem-solving.

Equal Access in an Unequal Society

Public schools are one of the few American institutions that try to take equality seriously. Yet their service in this cause has been ambiguous and frequently compromised, for the schools are a public institution oriented to equality in a society dominated by private institutions oriented to the market. In the schools America seeks to foster equality—and individual Americans seek to realize it. But in the market, Americans seek to maintain or improve their economic and social position, thereby contributing to inequality even if they individually wish the reverse. This paradoxical relation between education and capitalism has had an enormous impact on the schools and on the role education plays in American life.

During the late nineteenth century the very meaning and social purpose of education changed in response to the growing importance of market relations, or perhaps in response to *beliefs* about their growing importance. For most of those who struggled to create public schools in the 1830s and 1840s, education was valued for its moral and political content. The common school crusaders sought to assure that all Americans would attend elementary school and would be exposed to the same curriculum. One view, associated with egalitarian hopes, was that such schools would reduce the effects of economic class divisions by educating children from different groups and classes in the same schools and distributing knowledge more equally among rich and poor. By providing equality of educational condition for children, common schools would help create an equality of political condition among adults, thereby improving the chances that the great experiment in political democracy would succeed.[5] Another view, associated with conservative fears, was that such schools would resocialize immigrants and the poor to instill the appropriate beliefs about crime, private property, obedience, and work. In this view, schools would inculcate those beliefs that conservative reformers thought families and churches were no longer instilling effectively. In either view, schools were understood as a moral and political force, an agency for affecting beliefs, ideas, and political relations. And in either view also, schools were important because they would strengthen community ties.

With the growth of industrial capitalism, however, education came to be valued more in technical and economic terms. Part of the folklore of modernization is the notion that specialized technical knowledge is the key to economic development. This idea took hold powerfully in America, and by the early part of this century it was already an article of faith that special technical knowledge was the key to prosperity in the modern age. The flowering of this idea brought a wave of enthusiasm for science, technology, and the professions, and a passion for specialized formal education. One early fruit of this enthusiasm was a remarkable multiplication in the 1890s of career-oriented high-school courses in accounting, secretarial work, surveying, drafting, and similar fields.

Another theme in the folklore of modernization, especially pronounced in the United States, was the view of life as capitalist competition. Entrepreneurial success stories became a staple of popular culture in the late nineteenth century, and small epics of competitive success dotted newspapers and magazines. As visions of rags-to-riches infected the American imagination, competitive success became a popular commodity. Capitalist competition was democratized—it was not only the preserve of Rockefellers, Carnegies, and Morgans, nor did success depend on the accumulation of such gargantuan fortunes. Ordinary families could compete on a more lifelike scale, among other ways, by "investing in the future" with more education for their children. And schoolpeople, struggling to find a place in the new world of modern industry and competition, began to advertise education as a technical preparation for economic success. The 1890s saw the first large flowering of the notion, later to become dogma, that schooling and the formal, technical knowledge it imparted were essential commodities in capitalist competition, commodities required for the economy's advance, for any individual's economic advantage, and for stable social organization. The social meaning of schooling was transformed: schools, formerly an agent of moral cohesion and political equality, became the agency for forming "human capital."[6]

This changed vision of education affected the spirit in which Americans went to school: educational attainment became a crucial step in the race for economic and social position. This, in turn, had an enormous impact on American conceptions of equality. Its first manifestation came around the turn of the century, when the older policy of universal elementary schooling began to approach realization. The common school crusaders had assumed that, with few exceptions, eight years of education would be all that most Americans needed. But as the elementary schools filled up in the increasingly competitive atmosphere of the late nineteenth century, the realization of this egalitarian dream encouraged many middle-class and lower-middle-class Americans to believe that finishing elementary school was no longer enough for their children. They began to see the lack of high schools as a social problem. Americans who were eager to have their children make a better place for themselves thought that sending them to high school was one way to do it. There they could get more education, and it would be more specialized than that of elementary schools, giving high-school students an edge in competition for jobs and social status. Educators echoed and stimulated these sentiments with now-familiar arguments about the ever increasing requirements for ever more highly trained labor in modern societies. The changes were swift. Public high schools were an uncommon institution as late as the 1870s and 1880s, with selective admission, based on entrance exams, and modest enrollments. But they fast became popular, especially among the middle and lower middle classes. Between 1870 and 1900 enrollment increased six and a half times, from 80,000 to 519,000. High schools sprang up like mushrooms after a spring rain. In 1870 there were about five hundred public high schools; in 1900 there were about six thousand.[7] Most important, entrance requirements were changed: the admissions exams were dropped in favor of simple elementary school completion. This marked the beginning of the high schools' transition from an elite to a mass institution. It marked the beginning of the end of the half-century struggle to provide universal elementary education. And it marked the beginning of a long struggle for a new social goal—universal high-school attendance.

In a certain sense, then, the expansion of public high-school enrollment was a solution to the "problem" of universal elementary attendance. This last became a problem partly because, although growing numbers of Americans wanted to provide their children with a social and economic advantage beyond the elementary education that more and more were completing, they could not finance private education or did not have access to it. Public high schools supported by everyone's taxes offered these families the hope that their children could still enjoy a competitive advantage over all the others who were rapidly filling the elementary school; at the least, they offered the promise of a decent competitive position vis-à-vis one another. In addition, attending the "people's college" permitted families of the middling sort a favorite democratic pastime—the opportunity to emulate the monied classes, and perhaps, who knew, even to pursue them to the heights.

NEW DOCTRINE AND ORGANIZATION

This was the first in a long series of uneasy accommodations between the old democratic goals of equal access and universal attendance and the competitive economic meaning that became attached to school achievement later in the century. Americans have pursued equal access enthusiastically, but their beliefs about the competitive importance of schooling also have encouraged them to pursue policies and practices that pull in the opposite direction. One example of this, noted just above, has been the persistent tendency to greet the approaching achievement of equal access at any level of the school system with fevered enthusiasm for more education at the next higher level. Upward expansion protects competitive advantages for those who can purchase more schooling, but it also reduces the value of the soon to be universally held lower diploma, thus creating a relative disadvantage for those who cannot afford more schooling. Inequality, reduced at one level, is simply moved up a notch.

Further evidence of competition has been the effort to protect competitive advantages by means of internal differentiation, especially within the transitional level of schooling. Within two or three decades of the outbreak of the high-school fever, for example, skyrocketing enrollments brought an increasingly diverse population into secondary schools. Although students from middle-class and lower-middle-class families were still much overrepresented, more and more children from working-class backgrounds were enrolling. By the second decade of this century the high schools were on the way to becoming a mass institution with a quite diverse population. To accommodate these developments within the framework of intensifying competition over education, the schools dramatically changed their internal organization. Secondary schools had begun to multiply their offerings in the 1880s and 1890s to meet their students' more varied academic and occupational interests, but the basis of assignment was student choice. Shortly after the turn of the century the high schools were reorganized in a stratified fashion on the basis of student ability and occupational destination, with educators claiming much more authority over student assignment. Both the curriculum and the schools' organization were reshaped, roughly along the lines of the American class structure. Preparation for professional and technical jobs was allocated to academic and college entrance tracks, while preparation for lesser jobs was handled by several other curricula, ranging from general through clerical to vocational and manual trades. The social-prestige structure within the high schools followed this hierarchy. Educators spun elaborate technocratic fantasies, advertising the new organization as the centerpiece of the industrial system, a finely tuned mechanism designed to finish its human "raw materials" according to the varied skill demands of different occupational strata and to channel the finished products toward their proper occupational destination.[8] If overheated prose could have done the trick, schoolmen would have taken their place at the tables of the mighty, making weighty decisions about the destiny of the industrial system and those toiling in it.

Although no such reshuffling occurred, there was a radical redefinition of educational equality. The older doctrine of equality of condition was amended, or partly replaced, by a doctrine of equal opportunity. The former had stressed the importance of mixed attendance in common schools and exposure to a common curriculum as means of reducing the educational and political effects of economic inequality. It also had assumed rough equality of educational achievement—eight years of school attendance should be enough for nearly everyone. The newer doctrine of equal opportunity, by contrast, stressed the importance of exposing high-school students to different curricula in order to prepare them for the different work they would do as adults. And the new doctrine did not assume that schools would reduce the effects of class difference: schools would accept the class structure as a requirement of industrial efficiency and would train students for their places in it. Equality meant fair chances to compete for the best places in the occupational hierarchy, not equal exposure to the same curriculum. And the fairness of these chances would, in principle, hinge on "scientific" determinations of ability, as measured by IQ tests. Students with higher scores were assumed to be better suited for the top tracks in school and society, while those with lower scores were thought to be destined for smaller futures. If one were to believe the arguments of American educators at the time, the high schools were becoming paragons of meritocratic efficiency, making fair determinations about who was best for what, and training them accordingly.[9]

Things did not work out quite that way, but for a time the new ideas and organization held sway. The high schools certainly were seen as a great success, and enrollments continued to climb through the first half of this century. Americans could agree on the value of high-school attendance without facing hard questions about how the new organization actually worked and how it would affect the allocation of competitive advantages. One reason for this agreement was simply that the notion of fair competition had great appeal among those at the bottom of the heap as well as those better situated to compete. Another was that the new doctrines were implemented in a very imperfect fashion, leaving more room for teachers' judgments, parents' wishes, and students' interests than the technocratic fantasies would suggest. Still another reason for the broad agreement on the fairness of differentiated high schools was that, though testing and tracking were problematic in many ways, the high schools in which they occurred did represent appreciably increased opportunity for many American families. Some high school was better than no high school for many Americans newly arrived or from poor families, and the opportunity to crack the top track by means of a scientific test was better than no opportunity at all. Only a few voices rose to challenge the scientific validity of the tests or their fairness, or to question the extent to which testing and tracking passed on economic and social advantages from one generation to another. Walter Lippmann mounted perhaps the most cogent attack on the tests; George Counts exposed class bias in high-school curriculum assignment and graduation; and the Chicago Labor Federation attacked testing on the grounds that it discriminated against workers' children.[10] Had anyone wanted to listen, the arguments were there to be heard. But these dissenting voices found few others to amplify their message or carry it on.

Another reason that Americans could agree on the value of the new high-school education was the many students who did not get it. As long as those adolescents who did not care for school, and those from the most oppressed and deprived segments of the society, were mostly absent, the schools were not hard-pressed to figure out how to educate their most difficult potential students. As long as those for whom schooling was as much a problem as an opportunity stayed away in droves, it was hard to imagine the difficulties in providing them with a usable secondary education. As long as not graduating from high school remained socially legitimate, these adolescents could easily see other paths, and when there were jobs, take them. All of this meant that, prior to attendance laws, high schools were still schools of choice. They were still special, which in capitalist America meant that they were seen as a selective institution, middle class and white, not as a universally subscribed institution, proletarian and minority.

One consequence of selectivity concerned the terms on which education could be offered and received: it was harder for students to object to unfairness in education, and easier for educators to insist that the students who came play by the schools' rules. Because the institution was in some sense not yet fully public, the implied contract between students and schools was much stiffer than it has become, and easier to enforce. Schools could get more of the commitment they wanted from students because so many potential students were elsewhere.

Another consequence of selective high-school attendance earlier in this century was that no one could see the great problems that would arise if the crusade for universal secondary attendance succeeded. As is often the case with policies of equal provision, it is easy to overestimate their advantages, and easier still to underestimate their limitations, when only partial coverage has been achieved. The limits of equal access policies are really clear only when, once access is equalized, the results stubbornly remain much more unequal than had been hoped. This realization is at the core of current ideas about the high-school problem, just as it was at the core of turn-of-the-century ideas about elementary school problems. Selective coverage under a policy of universal access has more than once allowed Americans to think they could have their cake and eat it, too. Their disappointment when others, less fortunate, try to take their own slice is an old story, but like many such stories, it apparently must be experienced anew each time to be believed.

THE HIGH-SCHOOL PROBLEM TAKES SHAPE

In the first half of this century, then, Americans struggled to realize the promise of secondary education for all. Yet the closer they came to success, the more evident the problematic consequences of equality became; the more nearly universal secondary education became, the more this seeming victory for equality took on the color of a competitive defeat. In 1900 only slightly more than six out of every one hundred seventeen-year-olds graduated from high school; by 1930 the figure had risen to nearly thirty; and by 1950 it was fifty-nine.[11]

One result of these enrollment increases was that the social definition of high school changed radically between 1930 and 1950: by 1950 one was a failure if one did not graduate. The "high-school dropout" became a term of opprobrium as the high-school diploma became the new social minimum. A second result was that the focus of competition began to shift to postsecondary schools. High school was no longer enough—more education began to seem a necessity. College attendance zoomed upward, from 1.1 million in 1930 to 2.6 million in 1950. By 1960 attendance was 3.2 million. In these decades college became what high schools had been in the two decades embracing the turn of this century—the new arena for competition over education, an arena in which American families of middle-class and lower-class origins struggled to maintain their children's competitive advantage vis-à-vis those around them or below. Between the thirties and the fifties such families began to work and sacrifice on a large scale to provide higher education for their children, just as an earlier generation had struggled to accomplish this at the secondary level. Their endeavors helped to press the expansion of public higher education into a mass system and to support the allocation of state tax monies to help finance free education at state universities, just as similarly situated families had supported the use of local taxes for public high schools a generation or two earlier. And as before, while these developments expressed what might be termed class conflict, the conflict was not overt. The ethic of fair competition was widely accepted, and in certain important respects it worked. Both high schools and public colleges did become broadly available, and many children from lower-middle-class and working-class families did make it in—and up. From one perspective, then, raising the level of economic and social competition over education yet another notch seemed to do the trick—for a few decades at least. The competitive problems produced by approaching universal high-school attendance were deferred once again, as the focus of competition shifted upward to universities.

The rapid expansion of high schools had a variety of important indirect effects. One of these concerned elementary education. Once high schools began to assume the main burden of what is now termed "preparation for adulthood," a more relaxed approach to elementary school became possible. For most students in the late nineteenth century, elementary school was the only institutional step between childhood and work. Educators were therefore much interested in how elementary schools could help prepare their students for work in the new industrial age.[12] But within a few decades the high schools began to take over the burden of preparation for adulthood, and with this change, the elementary schools' mission began to shift: once the grammar school certificate was no longer the terminal degree, the competitive pressures on elementary schools started to diminish. The lower schools grew somewhat more open to new ideas about democracy and variations in individual development. Such ideas had been discussed and explored on a modest scale in the United States since the mid-1800s, but the progress of child-centered education was considerably enhanced by the growing sense, early in this century, that working life did not begin right after elementary school. This notion gained force as high-school enrollments grew during the twentieth century. Child-centered practices gained a larger foothold in the elementary schools, along with efforts to eliminate ability grouping, to remove vocational elements from the curriculum, to create a less competitive climate in classrooms, and to establish a less competitive and more egalitarian basis for treating students.[13] These changes in elementary schools have regularly been contested on the grounds that they were only a relaxation of academic standards to accommodate a more diverse student population. That was often the case, but despite these arguments, child-centered reform has made continuing, though not steady, headway since early in this century. More relaxed schooling became possible at the elementary level as long as the market-oriented competition was maintained in the high schools.

A second indirect effect of rapidly increasing secondary school enrollment appeared in Americans' vision of the high school. By 1950 roughly seventy-seven out of every hundred adolescents old enough for high school were enrolled, a huge jump over the figure just two decades earlier. And a disproportionately large part of the increase comprised black students and those from poor families. In consequence, in the 1950s the high schools became a social problem. Prior to that time the chief problem of secondary education that occupied popular attention had been getting more students to attend. But once attendance was well on the way to becoming universal, the situation was reversed: high schools themselves, rather than the lack of students in them, became the problem.

The history of the high-school problem began in the 1950s, then, and appropriately enough, in its first incarnation the problem seemed to be a decline in the quality of education, a weakening of the curriculum, and a relaxation of academic standards. University academics from Arthur Bestor[14] to Jerrold Zacharias attacked the quality of education. With the launch of *Sputnik*, federal funds for improved curriculum and teaching followed in short order, especially in science and language, and exclusively for college-bound students. In 1959 James Conant's *The American High School Today*[15] was published, attacking the low quality of education available and proposing the creation of large consolidated schools to improve offerings. Perhaps Conant's chief concern was the education of academically talented students, which he felt was slipping badly. The book was a great success. The tone in these developments was nicely captured by the central query of John Gardner's *Excellence* in 1961: "Can we be equal and excellent too?"[16]

In the mid-1960s concern about the quality of secondary education shifted briefly from excellence for the talented to equality for the disadvantaged. Indeed, the high-school problem temporarily receded during Lyndon Johnson's presidency, overshadowed by broader worries about the caliber of education generally available to the poor and to minorities, and by a sense that intervention earlier in children's lives was crucial. But by the late 1960s the high-school problem had returned, this time in a somewhat different incarnation; it now seemed to center in student protest, school disorder, and drugs. A panel of President Nixon's Science Advisory Council headed by James Coleman produced *Youth: Transition to Adulthood*[17] in 1973, a volume that announced the existence of a separate "youth culture" that tended to create hostility to adults and work and that shielded adolescents from proper socialization to adulthood. High schools were a central villain in Coleman's vision of the problem, for in his view these schools reinforced the youth culture by isolating students from the social and economic realities of adult life. Coleman prescribed a range of endeavors to break down the barriers between school and work, to reduce the school's grip on youth, and to promote more contact between adolescents and adults—a category in Coleman's analysis that seemed not to include high-school teachers. Other reports during these years proposed dismantling the large comprehensive schools that had been built partly in response to Conant's book, and to get high-school students out of school by reducing compulsory attendance requirements.

Since *Youth: Transition to Adulthood*, the high-school problem has resumed something like its earlier guise. In the mid-1970s attention was focused on the decline of SAT scores, a phenomenon extensively reported in the national press and repeatedly investigated by blue-ribbon panels and academic experts. Although the actual scope and origin of the decline remain in doubt, most commentators held that the lowering of academic standards in high schools was an important cause. Frank Armbruster, a defense analyst and a colleague of Herman Kahn at the Hudson Institute, published an extensive attack on liberal curriculum reform and progressive teaching methods in high schools. He regarded these as prime causes of the decline of test scores.[18]

Later in the decade attention turned to what some observers saw as an explosion of private secondary schools. The growth of Christian academies, among others, seemed evidence to many commentators that the public high schools could no longer educate for "character," as presumably they had once done. The moral failures of high-school education now occupy center stage. James Coleman has just published another study, this one of public and private high schools. The results, he announced, show that private school students produce better academic work than similarly situated public school students, and that they do so because private schools are better able to enforce a moral climate in schools oriented to achievement.[19] *Character*, a journal concerned with high schools and their students, recently began publication. If anything, concern about high-school problems appears to be growing. The Carnegie Corporation of New York has just announced its support of two national studies of American high schools—one headed by Ernest Boyer, a former U.S. commissioner of education, the other, by Theodore Sizer, a former dean of Harvard's Graduate School of Education and, until recently, headmaster at Phillips Andover.

THE PARADOX OF EQUALITY

The sense that there is a grave high-school problem is thus itself one effect of the changes in American high schools that came about as the schools became more equal, at least in enrollment. In part this is due to the anxieties that accompany egalitarian achievements in a highly competitive society. With only one exception, American attention to high-school problems since 1950 has been focused principally on the problems of advantaged students; and those worrying about the problem have, with few exceptions, been drawn chiefly from the intelligentsia, not the working class or minority groups.

But, the worries about academic standards have also been a sane response to the paradoxical consequences of equality in U.S. education. Viewed from one perspective, by reducing great inequalities of access, America has made great strides in secondary education since World War II. By 1979 state reports showed that roughly ninety-nine out of every hundred students were enrolled in secondary schools, and that about seventy-five out of every one hundred seventeen-year-olds were graduating from high school.[20] These developments mean that inherited economic and social status is no longer as powerful a determinant of high-school completion as it once was, though those who do not graduate are still disproportionately drawn from society's lower orders. There has also been a dramatic reduction in racial disparities in high-school attendance; black-white gaps in attendance and graduation have closed considerably, though blacks are still overrepresented among those who do not complete high school. And these enrollment changes reflect changes in policy and practice vis-à-vis children with physical and emotional handicaps. The passage of Public Law 94-142 was only the most recent and far-reaching of recent efforts to make education available to all students.[21]

As attendance has expanded, so have the services schools provide. Children who once could not attend school because there were no appropriate programs or physical facilities can attend, because schools now have such programs and facilities or are trying to provide them. Also, many children with less severe handicaps who were in school but were not receiving special help now have educational programs designed to meet their needs. And as recent immigration has once again expanded America's language minorities, legislative and judicial actions have considerably enlarged the schools' responsibilities in dealing with such minorities. All of these steps and others signal an expansion of equality and at least partial fulfillment of earlier hopes for education.[22]

But because these victories for equality occurred in the context of intense competition over education, the competitive response to equality has tarnished the victory in several respects. The expansion of higher education meant that more equality was possible at lower levels because inequality was now maintained in postsecondary schools. This, in turn, meant that egalitarian gains in public secondary schools became possible largely because the A.B. superseded the high-school degree as the diploma of merit. In effect, the competitive zeal for higher education debased the value of the high-school diploma, just as the zeal for high school had earlier deflated the value of an elementary education. Gains for equality seem real enough, but because they occur in the context of fierce competition over schooling, they are compromised as they are being made. Education is more equal in one respect, but it also is devalued in response to equality.

Historically, this paradox has been most clear in the changes in curriculum and in requirements for graduation that have accompanied increasingly universal access to high school. In the case of curriculum, as more and more immigrants and working-class children attended high schools early in this century, educators began to move the focus of high-school studies away from traditional academic work toward what they judged to be the "practical" needs of such students. By the end of World War I the announced aim of high schools, according to a national blue-ribbon panel of educators, was to "adjust" students to the practical requirements of their lives as citizens and workers.[23] Although some educators continued to follow Charles Eliot and his earlier Report from the Committee of Ten, holding that rigorous intellectual training was important to all students because it taught them how to think, more and more educators argued that such training was useless for everyday life. One essential element in this view was the belief that the new students in the high schools were unable to cope with a serious academic curriculum. Ideas about the new students' mental capacity had been shaped in part by results of standardized tests that had been devised and administered during the first two decades of the century. On the basis of these tests, particularly those given to army recruits during World War I, many educators concluded that 60 percent of high-school students were not bright enough to benefit from the academic curriculum of the high school. Instead, it was thought that they could benefit from a less demanding course of study geared to their "interests" and "needs." Course offerings of this sort multiplied in high schools early in the century, and requirements for English, mathematics, and foreign language study were slowly relaxed.

But if the presumed deficiencies of working-class and immigrant youth were one inspiration for these changes, the reorientation of curriculum toward the "practical" was not confined to the lower high-school tracks. As time passed, antipathy to academic training grew. With the "life adjustment education" movement that thrived in the thirties, many educators questioned the value of traditional academic training for all students, even the brightest. As a result, the less demanding, more diverse curriculum was gradually extended to all high-school tracks. In several cities the responsibility for rigorous academic training began to pass from the academic tracks of all comprehensive high schools to a few specialized academic schools—the so-called examination high schools.

The argument between advocates of practical and academic training has been a long one and continues to the present. On the whole, however, the drift has been toward the practical, and in the course of the debate, the content of the positions has changed. In particular, the meaning of academic rigor has seriously eroded. For example, the return to academic rigor is currently espoused by those who want greater emphasis placed on "basic skills"; but one of the chief ambitions of this back-to-basics movement is to make sure that high-school graduates can fill out a simple income tax form or a job application. That conception of the aims of academic rigor is a far cry from that of Charles Eliot.

These changes in curriculum have been accompanied by a gradual relaxation of standards for promotion and graduation, principally by means of social promotion. Although historical evidence on this point is scarce, it appears that the practice of advancing students from year to year on the basis of age, rather than on the satisfactory completion of academic requirements, first became widespread in elementary schools around the turn of this century, as a means of dealing with the consequences of universal attendance. The practice was extended to the nonacademic tracks of high schools, when filling up these tracks became the high schools' first response to a more diverse and less select student body early in this century. In the 1930s life adjustment education provided a rationale for extending the practice to all high-school tracks, just as high-school attendance was being swelled by large numbers of students, especially those from poor and working-class families. And after World War II, when high-school attendance became more universal, social promotion appears to have become a nearly universal means of dealing with large numbers of students whose academic performance was insufficient to warrant promotion on academic grounds. By the 1960s, if students did not graduate from high school, it was more likely to be the result of nonattendance than of failing to pass through the grades. Social promotion is a way of coping with the effects of more equal attendance, though at the cost of debasing the value of the high-school diploma.

Taken by themselves, these changes have probably had a corrosive effect on academic performance. But to complicate matters further, it appears that as the high-school curriculum has been simplified over the decades, standards for literacy have been rising.[24] When we speak of literacy today, we tend to mean the ability to read in order to learn something new, or more simply, to be able to follow written directions. However, not until the time of World War I did the ability to read silently and understand an unfamiliar text become the goal of mass education. Prior to this time literate individuals were those who could declaim familiar texts aloud. Getting new meaning from texts—in fact, getting *any* meaning from texts—was not the goal of reading instruction throughout the nineteenth century. Some educators encouraged reading for meaning, believing that it would make reading instruction more "palatable" to children, but their influence was not great.[25]

The pressure to change the old, simple conceptions of literacy and reading instruction grew slowly in the late nineteenth and early twentieth centuries, but the catalyst that first turned reading into a social problem was, again, the new standardized tests used on army recruits during World War I. When these tests were first given, a large proportion of recruits failed, even though they had completed enough years of schooling to support the assumption that they could read well enough to pass. However, the Army Alpha test required the reader to read silently and answer questions on new material. Reading instruction, as well as the definition of literacy, began to change, partly as a result of the test scores and partly in response to increasing levels of education in the population. The older definition of literacy slowly gave way to one that demanded a higher standard of achievement. But the tests that promoted a new and more difficult definition of literacy also convinced many educators, including the life adjustment advocates, that 60 percent of the population were not very bright. And this conviction reinforced efforts to water down the curriculum, including the slow decline of reading difficulty in textbooks over at least the last thirty years. Thus standards of literacy have been rising as high-school reading requirements have been relaxed.[26]

TRANSFORMATION OF THE HIGH SCHOOLS

Access to high school has become more equal during the course of this century, but educators have responded by reforms that have sometimes debased the content of secondary education. These developments have been complicated by others that followed World War II, when high-school attendance rose to more than three quarters of those eligible. At that point high school was no longer the last step before work: soon more than half of the eligible population was going on to some form of postsecondary education. One effect of moving the competition for educational attainment up a notch to college was to create a more socially sheltered atmosphere for the high schools, much as the high-school fever deflected some competitive pressures from elementary schools, beginning earlier in this century. While postsecondary education may not become universal soon, its growth has encouraged expansion of the age boundaries of childhood. If high school is no longer the last stop before adulthood and work, then secondary students can be treated in a more informal and playful fashion. Deferring the immediacy of work defers the pressures of preparing for it, and permits a reinterpretation of the curriculum to suit students' intellectual or cultural interests. During the last fifteen years or so these tendencies have been reflected in eased course requirements and in less formal social relations between many faculty and students. Courses and study programs organized around ethnic and racial differences have blossomed; alternative high schools within public systems have grown up; and courses that seek to use various elements of pop culture to catch students' interest in deeper issues have become more popular. These developments have sometimes been accompanied by decreased academic rigor. Students in alternative programs have sometimes had few academic demands placed upon them; ethnic studies programs have sometimes been superficial or lacking in any element of study at all; and mini-courses on the detective novel or science fiction can never teach the more important elements of literature. In one sense, these reforms seem a step forward, since they are in part an effort to create a curriculum that is available to the very diverse student population that equal access has brought into the high schools. But in another sense they sometimes represent a dilution of curriculum, as education is extended to more students from the lower orders of society. Access is more equal, but the consequent upward expansion of child-centered education has often reduced the rigor of academic offering.

This paradox is complicated by another. The high schools are populated by people who are biologically adult, and in the upper grades these people have long been defined as nearly adult in social and economic terms. Moreover, they are treated as adults in many ways by the economy and the culture. Their dress, their sexual habits, their entertainment, the advertising directed at them, all make it difficult to distinguish eleventh and twelfth graders from people ten years their seniors. Yet the changes in curriculum and organization of their schools just described are reminiscent of elementary education: the high schools seem to be less "businesslike" and, therefore, in terms of American experience, less serious. These crosscurrents perplex students, teachers, and others concerned with secondary schools, for in the competitive context of American education, the recent expansion of child-centered education into secondary schools looks like a relaxation of standards for those newly arrived.

The more relaxed character of life in high schools is not a response to equality alone. Recent developments in the economy and the culture have given powerful impetus to changes in high schools. We pointed out earlier that high schools worked for a long time because many students for whom the high schools could not provide a decent education simply stayed away—or if they came, kept quiet. But those days have been gone for some time, and their disappearance brought a fundamental change in what people expect from school, and a change in how students use high schools. The economy has not been pulling many students out of the high schools into work for several decades now; in fact, youth unemployment rates have been steadily increasing. This is not exactly a new development; high-school enrollment fluctuated with unemployment rates in earlier times, but the only change in the rates for decades now has been upward. In addition, the long improvement in economic conditions and social welfare since the bleak days of the late nineteenth century has provided many families, even poor ones, with resources that have substantially eased former pressures on adolescents to take work, any kind of work, to keep their families afloat. These changes, along with the growth of a national culture oriented to middle-class and cosmopolitan tastes, have made many once-acceptable working-class jobs seem not only less acceptable, but also less necessary to accept. Education, among other factors, has helped convince many children of the working class and the poor that they deserve better jobs than they can find.[27]

These developments mean that although high-school attendance is virtually universal, it is not due to a desire for learning nor even to a hunger for the presumed economic fruits of schooling. Often it is simply the result of having nothing better to do. The high schools now have large numbers of students for whom school is a problem, a bore, the best entertainment available in a poor selection, or a necessary evil to be borne grudgingly. Students who cause trouble or who do not do the work are more difficult to suspend or expel when attendance is universal, a point that has been reinforced by recent court decisions. And problem students often cannot be tactfully counseled out, in part because often there is little to counsel them toward.

In response to these developments, students and faculty have been converting their schools into a different sort of institution, or perhaps only adding another facet to those already there. High schools are becoming a sort of state-supported social service center for adolescents at loose ends. In addition to the many other purposes they serve, these schools are increasingly being turned into a place to hang out, an alternative to the street, to unemployment, or to unattractive work—even a place to find some diverting activities in the absence of anything else to do. In some schools, for example, a federal program that had originally been intended to teach students about various career opportunities has been transformed, by students and teachers, into a means of getting adolescents out of school into part-time work[28]. Many local projects permitted students to gain academic credit for their work experience, and permitted the schools to remake—and sometimes water down—the curriculum to suit the needs of students who were academically marginal. The students were pleased to get part-time jobs through the school and to get credit for work—which in some cases did include writing about it. The schools were pleased to find a way to do something for some students who were bored or restless and frequently quite uninterested in academic work. In other schools, faculty members have tried to adapt to universal attendance by devising courses and other activities that will interest students, or by creating activity areas where students can gather without cluttering up the halls, or simply not bothering those who come to school to hang out and see their friends rather than to attend class.

The spontaneous transformation of secondary education from below is a fascinating adaptation of an institution to changes in the character and purposes of its clients. The changes reflect in part the way adolescents have found to cope with the eased pressures to work full time and with the increased pressure to attend school. They also reflect the schools' efforts to adapt to universal attendance and to the increasing difficulty of getting students out of school by other means than giving them a diploma. In practice, the definition of equality that has developed in American secondary education has left less and less room for schools to control student exit on grounds of achievement, a change that fits nicely with the more relaxed standards for academic performance and social deportment associated with the upward spread of child-centered reforms.

These changes in high schools have softened both academic and social standards. They have tended to weaken the value of the high-school diploma and to convey the sense that secondary education is less special—and less serious—than was once the case. But if the changes have pressed high schools in some new directions, they occur within an institution whose organization still embodies the old assumption that high school is a serious competition for educational achievements that will bring real economic rewards. The result has been to put into clearer relief the contradictions that riddle American high schools. The old assumptions are still dominant in official ideology and organization, but they are contradicted by new practices that seek peace with changed conditions. The schools thus profess both rigorous academic work and relaxed experiences, respect for the classical curriculum and regard for the mini-course. They proclaim the economic value of academic struggle, yet they do so in the midst of an economic situation that seems to belie the proclamation. Indeed, the images of capitalist competition that once inspired and accompanied so much of the struggle for high-school education now seem a sad, even wicked parody.

While the high schools are thus more of a puzzle, more a bundle of contradictory tendencies than ever before, students and faculty must somehow make sense of these contrary tendencies in their daily activities. For the first time in history the schools must contend with a large number of students who explicitly doubt that participating in the great academic competition will do them much good. Many reject the idea outright. And as belief that the competition makes sense declines, the legitimacy of the schools' organization becomes less convincing. Of course, ever since early in the century there have been many students who knew that the competition was loaded against them, but some accepted it, hoping to make their way and perhaps even change its terms. Others accepted it even when ground down by it, because the selective character of attendance made challenges difficult. But recent developments have made it much easier to challenge the high schools' organization and the ideas it embodies. The high schools have been at the center of political storms for two decades now, storms that often centered specifically on minority students or on issues close to them: desegregation; student rights; fair treatment of the handicapped; bilingual education; and more. In each of these cases the schools have come in for more explicit political criticism than ever before in their history: the discriminatory and often racist character of education in the United States has been well ventilated, and the schools' treatment of less fortunate members of society has been under steady attack. These attacks have been fundamental in character, raising explicit questions about the legitimacy of the enterprise. Challenges from the world of adult politics have spilled over into the everyday life of schools—in strikes, street demonstrations, court injunctions, and the like.

All this provides students with a political education of no mean importance, and raises doubts in the minds of students and teachers about the character and usefulness of their work. Academic and popular attacks on the legitimacy of both academic and capitalist competition have become easy and even fashionable, and have weakened the old assumption that doing well in school garners economic rewards in adult life. Whether researchers argue that schools do little to reduce economic inequality, or that schools do much to maintain and harden inequality, or that the economic returns of schooling have been exaggerated—whether or not schools increase equality[29]—these challenges reinforce what students and teachers know about the economy, youth unemployment, and the like. Along with the broader conflicts that have been played out in schools, they have encouraged students and teachers to produce their own challenges, in the small political life of classrooms, in teachers' meetings, and the like. By now many students and faculty simply do not believe that the institution is fair, or that it is organized to serve them respectfully or well. For the first time many are willing to say so.

Awareness of social problems can be helpful in solving them. But the greater politicization of students and faculty itself contributes to the problems of high schools, because there is now a more widespread and forceful sense in the schools that they are in trouble—perhaps, in some sense, even illegitimate—and this makes them less viable. In many schools, teachers and administrators must work harder than ever to gain or maintain authority. The problems of inequality in education are now more visible to students and teachers. This awareness has made the schools livelier but in certain respects more difficult places to work.

High School Reform?

Ours is not the only way to tell the story. High-school problems appear in a variety of distinct and vivid terms to those embroiled in them. Teachers may see them as a collapse of interest in academic work or as a loss of faith in teachers. Administrators worry about an upswing of defiant behavior. Parents are distressed that their children seem to take school so lightly and to disdain the path by which they made their way. Others see a loss of nerve or a relaxation of larger competitive energies. Whatever the diagnosis, together these ideas have once again added up to a sense of crisis in the high schools, to heated opposition to some recent developments, and to cries for reform. Some partisans focus on the quality of instruction in reading, writing, and mathematics; others object to recent curriculum reforms on the grounds that mini-courses and studies of academically marginal material reduce the opportunity to learn more basic subject matter; still others attack the new interest in ethnic studies as irrelevant or worse. And some reject these innovations as racist or discriminatory because they relax standards for minority groups or the poor while leaving more demanding work available to advantaged students. The objecting teachers, parents, and public officials support a list of counterreforms, perhaps the most popular being minimum competency testing. Advocates hope that these new tests will provide incentives for students and teachers to work harder. There is a revived interest in teaching "basic skills," in private schools, and in religious education.

These school wars sometimes caricature sane reform impulses. The minimum competency testing movement, for example, has spawned tests that are poorly made and that lack sensitivity to school curricula. To the extent that such tests affect anything besides the fleeting contents of the daily newspaper's front page, they seem likely to degrade teaching and to turn sensible efforts to improve learning into defensive rearguard actions against badly constructed exams. And there are plenty of counterparts on the other side of the educational barricades—mini-courses on science fiction as literature or local history study that consists largely of neighborhood walks. These examples and the passions they stir up are only the most recent version of old shoot-outs that began over elementary education with Froebel, Colonel Parker, John Dewey, and their many enemies. The schools are a great theater in which we play out these conflicts in the culture; they are a stage for the long war over the character of adult life that Americans prefer to wage on the friendlier terrain of childhood. Generations of ordinary Americans have had front row seats, and often leading parts, as the opposing battalions drew up their forces at PTA or school board meetings. We know many of the roles and leading players; even the lines are by now quite familiar.

These reforms will undoubtedly affect high schools, some for the better and others not. But we doubt that the current crop of changes will produce fundamental improvements, because none respond to the dilemma these schools face: secondary education has made substantial advances in the direction of equality, but this has eroded the sense that high schools are special institutions with valuable things to offer those who labor in them. Without greater equality, the fundamental political promises America offers would remain hollow and defeating; but without the sense that their schools are special, valuable, and worth sacrificing for, students and teachers cannot generate the mutual commitment that every school and classroom must have if it is to be a good place to learn. The high schools have moved far in the direction of equal access, but because these steps occurred in the context of fierce social and economic competition, advances for equality have been accompanied by the gradual debasement of secondary education. This debasement lies partly in the eyes of beholders who have difficulty believing that an equal institution can be excellent, and partly in the dilution of academic standards by educators and communities who cannot believe that excellent and demanding education is possible for most students. Public high schools cannot be made better by turning back the clock, reversing the fundamental gains for equality that have been made—though many who turn to private education or who worry about reinstating education for "character" seem to think that such movement is possible. On the contrary, that would almost surely further debase the character of public secondary education, either by depriving it of a democratic public or by eroding these schools' sense of special value even more. Basic improvements in public high schools may require real inventiveness, designed to endow institutions that are public and universal with the sense that they are also institutions of special value, unique and attractive to students and teachers. Perhaps means can be found to marry equality with a sense of institutional uniqueness. If so, high schools could create and release the mutual commitment that is required for good teaching and learning.

REFERENCES

We are grateful to Jeanne Chall for discussing with us her work on the possible connections between the difficulty of textbooks and student SAT scores and for directing us to other work on

that subject and on the broader topic of literacy. We also thank David Tyack and Elisabeth Hansot for their cogent comments on an earlier draft of the paper. Especial thanks to Maria Sachs for maintaining her editorial wit through many revisions.

[1] The popular media have a long tradition of helping to shape the problems to which the public and then the schools respond. For example, Raymond Callahan, in *Education and the Cult of Efficiency* (Chicago: The University of Chicago Press, 1962), wrote: "That genuine problems existed in American society at the turn of the century there can be no doubt. But the generation of widespread public enthusiasm and indignation necessary to give force to a reform movement in a democratic society required that the public be aroused and informed. This function was performed so effectively by the muckraking journalists through the medium of low-priced periodicals that one historian has stated that "to an extraordinary degree the work of the Progressive movement rested upon its journalism" and that "it was muckraking that brought the diffuse malaise of the public into focus (p. 3)."

[2] It is important to note that Americans have a long tradition of finding fault with their schools: smooth-running schools share "a poverty of dramatic interest." (Harry S. Broudy. *The Real World of the Public Schools*. New York: Harcourt Brace Jovanovich, 1972.) What is more, the content of the complaints has remained remarkably constant over time—from the loss of discipline to standards in the curriculum. For example, although we think that discipline was firm in the past, examination of early school reports reveals that "in 1837 some three hundred teachers were driven out of their schools [in Massachusetts] by unruly and riotous pupils over whom, in spite of the prevalent use of the whip, they were unable to keep any semblance of order." (Merle Curti. *The Social Ideas of American Educators*. Paterson, New Jersey: Littlefield, Adams, 1963.) And "To play a trick on the master was an evidence of spirit; to 'lick' the master was to be crowned hero of Flat Creek district." (Edward Eggleston. *The Hoosier School-Master*. New York: Hill and Wang, 1957. Originally published, 1871.)

We assume that academic and student effort were greater in the past, yet as long ago as 1878 there were many who mourned the loss of the traditional curriculum and decried the institution of diverse course offerings, and believed that standards had dropped and students were being coddled. For example, "Very much of the teaching which I heard was, in a sense, too good. Everything was made so plain and so easy that there was no hard work left to the scholars. This struck me again and again in schools of every grade. . . . When [one geometry] Class was over, I asked the lady whether she believed that this was the right way of teaching mathematics, and whether she did not think the girls would derive more benefit from their studies if she left them to do more of the work themselves. She said: "When I was a girl, I was not helped in this way; I had to dig out everything as best I could; I was thrown upon myself; but the girls have so many subjects to study now that they would never get through their work unless they were taught as I have been teaching them. . . . with our present range of subjects we have no choice; the teachers must do everything for the scholars." (B. A. Hinsdale. *Our Common-Schools. A Fuller Statement of the Views Set Forth In the Pamphlet Entitled, Our Common-School Education*. Cobb, Andrews & Co. 1878.)

[3] It is important to note that each time access to education has been achieved for a new group, it is followed by a concern about what to teach them and with a subsequent cry that the standards of the schools are slipping. So, for example, during the Depression more students stayed in school longer since job opportunities were few. Schools diversified their curricular offerings to meet the needs of these students. These reforms were followed by claims that the schools had deteriorated. See Henry Perkinson, *The Imperfect Panacea: American Faith in Education, 1865-1965* (New York: Random House, 1968); Broudy, *The Real World of the Public Schools;* and David Tyack, "The High School as a Social Service Agency: Historical Perspectives on Current Policy Issues," *Educational Evaluation and Policy Analysis* 1 (5) (1979), for a discussion of these patterns.

[4] What is more, the problems we choose to address are only a sample of the potential problems that could be defined. Herbert Blumer reminds us that "it is a gross mistake to assume that any kind of malignant or harmful social condition or arrangement in a society becomes automatically a social problem for that society. The pages of history are replete with instances of dire social conditions unnoticed and unattended in the societies in which they occurred. ("Social Problems as Collective Behavior," *Social Problems* 18 [3] [1971].)

[5] For example, see Benjamin Rush, who wrote: "I conceive the education of our youth in this country to be peculiarly necessary in Pennsylvania, while our citizens are composed of the natives of so many different kingdoms in Europe. Our schools of learning, by producing one general and uniform system of education, will render the mass of the people more homogeneous, and thereby fit them more easily for uniform and peaceable government. . . . Young men who have trodden the paths of science together, or have joined in the same sports, whether of swimming, scating (sic), fishing, or hunting, generally feel, thro' life, such ties to each other, as add greatly to the obligations of mutual benevolence." ("On the Mode of Education Proper in a Republic" [1786], in Benjamin Rush, *Essays, Literary, Moral, and Philosophical*. Philadelphia: 1806.) Also, members of the Workingmen's Party, who pressed for a system of public education: "The main pillar of our system is general education; for it is an axiom no longer controverted, that the stability of a republic depends mainly

upon the intelligence of its citizens—that in proportion as they become wise they become virtuous and happy—that the period for forming a good and useful citizen is in youth, ere ignorance and crime have deluded the mind by a lengthened dominion over it, and therefore that an early and suitable education for each child is of primary importance in maintaining the public weal. . . . [We desire] the establishment of institutions where the children of the poor and the rich may meet at that period of life, when the pomp and circumstance of wealth have not engendered pride; when the only distinction known will be the celebrity each may acquire by their acts of good fellowship; when the best opportunity is afforded for forming associations that will endure through life, and where the obloquy attending the present system will not attach. (Workingmen's Party, 1838) In addition, there are a number of individuals who expressed great interest in the educational system of the nation and who developed plans for such a system. Several of these are described in Allen Oscar Hansen, *Liberalism and American Education in the Eighteenth Century*. (New York: Octagon Books, 1965. Originally published by Macmillan, 1926.)

[6] See Edward A. Krug, *The Shaping of the American High School* (New York: Harper & Row, 1964), especially chapter 8, for a description of the changes in high-school programs; and chapter 9, for changes that related high-school program to opportunities in the work force.

[7] Ibid., chapter 8.

[8] Ibid., for a detailed historical description of these changes.

[9] There have been several changes in the meaning of "equal opportunity" in education throughout our history. "The original concept of equality of educational opportunity was based primarily upon the proposal that no one of superior intelligence should be denied the opportunity to continue through elementary and secondary schools, through the college and the university. We had a one-track school system. . . . We no longer believe that a single-track school system provides equality of educational opportunity. In our more progressive school systems, the traditional elementary school and senior high schools have been replaced by schools which seek to provide unique opportunities for boys and girls who vary greatly in their ability to acquire skill or knowledge. . . . we have provided schools in which individual instruction is given, others in which groups are organized with respect to their general intelligence or special abilities, classes for those who are backward, delinquent, physically handicapped, and the like. . . . For the high school, which was available for only the top ten percent in intelligence, we have provided the comprehensive high school with multiple curriculums, enrolling more than fifty percent of all boys and girls of high-school age. (Proceedings of the 68th Annual Meeting of the National Education Association, 1930) This change in the meaning of equal educational opportunity is noted by other authors. Martin Trow notes that prior to the development of mass comprehensive high schools, equal opportunity meant "the right of all who might profit from secondary education as so defined to enjoy its benefits." Geographical location and financial condition were the obstacles to be overcome in achieving this goal. However, as the first third of the twentieth century ended and enrollments swelled, and the impact of Dewey's ideas emphasizing the central role of the child in the educational process took hold, the definition changed. Cremin notes that equal opportunity came to mean "simply the right of all who came to be offered something of value, and it was the school's obligation to offer it." (In Martin Trow, "The Second Transformation of American Secondary Education," *International Journal of Comparative Sociology* 2 [1961]:144-65.) This shift in meaning has profound implications for the secondary schools, which now must offer programs matched to the needs of an expanding and therefore increasingly heterogeneous school population. The schools' success is now judged by a new set of criteria rather than by the provision of one particular curriculum.

[10] For the text of Walter Lippmann's comments, see N. Block and G. Dworkin, *The I.Q. Controversy* (New York: Pantheon Press, 1976). Also, see George S. Counts, *School and Society in Chicago* (New York: 1928) and "The Senior High School Curriculum," *School Review and Elementary School Journal*, *Supplementary Educational Monographs*, no. 29, 1926.

[11] These numbers and the statistics on college attendance were taken from W. Vance Grant and Leo J. Eiden, *Digest of Educational Statistics, 1980*. (Washington, D.C.: National Center for Educational Statistics, 1980).

[12] These efforts occurred in the context of educators' growing consternation over the increasing popularity of elementary education. As universal attendance approached realization late in the nineteenth century the schools were deluged with elementary students from working-class and immigrant homes. Educators tried dozens of ways to organize elementary schools to deal with this new variety of students. Many schemes, some quite ingenious, were devised in the 1880s and 1890s and tried for a time. But within a few decades, ability groupings on the basis of scientific tests seized the imagination of educators and carried the day.

[13] There is a persistent tendency among working-class and minority families to reject child-centered reforms, doubtless because children from such families are more likely to have only elementary education. In the American context, this reality encourages their families to place a premium on an education that promises to prepare them for work.

[14] Arthur Eugene Bestor, *Educational Wastelands; The Retreat from Learning in Our Public Schools* (Urbana: University of Illinois Press, 1953); also, Mortimer Smith, *And Madly Teach* (Chicago: H. Regnery Co., 1949).

[15] James B. Conant, *The American High School Today* (New York: McGraw-Hill, Inc., 1967).

[16] John Gardener, *Excellence: Can We Be Equal and Excellent Too?* (New York: Harper & Row, 1961).

[17] James S. Coleman et al., *Youth: Transition to Adulthood* (Chicago: University of Chicago Press, 1974).

[18] Frank Armbruster, *Our Children's Crippled Future: How American Education Has Failed* (New York: New York Times Book Co., 1977).

[19] Coleman subsequently agreed with some critics that the evidence did not support these conclusions.

[20] Grant and Eiden, *Digest of Educational Statistics, 1980*.

[21] Some of the categories into which special education children have been sorted have changed over the years, making precise comparisons difficult. However, the absolute increases in the numbers and proportion of these children attending school have been astonishing. In 1922, for example, the U.S. Census lists 23,000 "exceptional" children in the schools; this was 0.1 percent of the total school population. By 1932 the Census reported the presence of 164,000 exceptional children having a wide variety of handicaps in all twelve grades—0.57 percent of all school children. By 1980 nearly 10 percent of children between the ages of three and twenty-one were enrolled in special education classes.

[22] Indeed, so extensive has the high schools' coverage become that reformers are now trying to call attention to smaller and more marginal segments of the population: children of migrant workers; students who are married, or pregnant, though unmarried; students who have been suspended or expelled; students in jails with no high-school facilities; and inhabitants of remote rural areas where there are no high schools.

[23] This discussion of life adjustment education draws heavily on chapter 13 of Richard Hofstadter's *Anti-intellectualism in American Life* (New York: Vintage Books, 1966).

[24] The discussion of historical changes in the meaning of literacy relies heavily on three sources: Daniel P. Resnick and Lauren B. Resnick, "The Nature of Literacy: An Historical Exploration," *Harvard Educational Review* 47 (3) (1977); Eugene Radwin, "Literacy—What and Why," qualifying paper submitted to the Harvard Graduate School of Education, November 1978; and a conversation with Jeanne Chall, professor of education, Harvard University.

[25] Resnick and Resnick in "The Nature of Literacy" make an important point in this regard. They write: "Unless we intend to relinquish the criterion of comprehension as the goal of reading instruction, there is little to go *back* to in terms of pedagogical method, curriculum, or school organization. The old tried-and-true approaches . . . were designed neither to achieve the literacy standard sought today nor to assure successful literacy for everyone. . . . early dropping out and selective promotion were in fact used to escape problems that must now be addressed through a pedagogy adequate to today's aspirations (p. 385)."

[26] Some analysts of the factors that have influenced the recent decline in test scores point to the relationship between the difficulty of the texts and the test scores. They argue that over the last thirty years the challenge of the texts, particularly, but not only, at the elementary level, plummeted, and that this helps to explain lower test scores, especially among the top students. Jeanne Chall made this point in testimony before the Subcommittee on Education, Arts and Humanities of the Committee on Labor and Human Resources, U.S. Senate, 96th Congress, 1979. In addition, in *An Analysis of Textbooks in Relation to Declining SAT Scores*, June 1977, Chall writes: "In general, the sixth grade history textbooks in use during the declining score years seemed almost to change their purpose. From books that were meant to be read, they seem to have become encyclopedic magazines intended to be used for browsing or for reference. . . . The findings for the eleventh grade textbooks are quite similar to those for grade 6." For a different point of view, see testimony by Roger Farr, vice-president, International Reading Association, before the same subcommittee.

[27] See Ivar Berg, " 'They Won't Work': The End of the Protestant Ethic and All That," in *Work and the Quality of Life*, James O'Toole (ed.) (Cambridge: MIT Press, 1974).

[28] Eleanor Farrar, John E. DeSanctis, Peter Cowden, "The Walls Within: Work, Experience, and School Reform," final report to the National Institute of Education, Washington, D.C., July 1980.

[29] See Christopher Jencks et al., *Inequality* (New York: Basic Books, 1972); also James E. Rosenbaum, *Making Inequality: The Hidden Curriculum of High School Tracking* (New York: Wiley/Interscience, 1976).

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FORUM

SOME OBSERVATIONS ON THE REPORTED GAP BETWEEN AMERICAN AND SOVIET EDUCATIONAL STANDARDS

Reports that Soviet high school students take more math and science courses than U.S. students may not stand up to a careful look at course content

By Iris C. Rotberg

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There have been a number of recent newspaper and journal articles suggesting that the United States has fallen dramatically behind the Soviet Union in science and mathematics education.[1] The articles typically compare the number of years American and Soviet students spend studying mathematics and science courses. They conclude that by the end of secondary school (which is a ten-year cycle in the Soviet Union rather than twelve years as in the United States), the number of mathematics and science courses taken by Russian students far exceeds the number taken by American high school graduates. The purpose of this paper is to assess the extent to which the reported gap is supported by empirical evidence.

The articles are based on reports by Izaak Wirszup, a mathematics professor at the University of Chicago. In testimony prepared for the Senate Subcommittee on Science, Technology and Space, Wirszup described new mathematics and science curricula that have been developed in the Soviet Union during the past 15 years and stated that "a dangerous gap exists between our educational standards and those of the Soviet Union. We must begin to view education as a critical renewable resource essential not only to our well-being, but to our survival."[2]

Wirszup's claims are based on several considerations in addition to time spent in science and mathematics instruction. For example, Wirszup states that the new Soviet mathematics and science curricula are superior to curricula used by American students; the Soviet practice of spreading course work in each subject over a period of several years is better educationally than the American custom of concentrating the material in one-year courses; Soviet teachers are better trained in the curricula; and more students receive sophisticated mathematics and science courses in the Soviet Union than in the United States. These issues have been discussed in some detail by several recent articles and are not addressed here.[3]

I would observe only that while it is difficult for American researchers as outsiders to assess the quality and distribution of educational services in the Soviet Union, there

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is some question about the extent to which Soviet students outside urban areas and elite institutions receive demanding mathematics and science instruction. Wirszup himself notes that Soviet educators may face significant problems with the new curriculum.[7] He reports that teachers have serious difficulties in teaching the curriculum; that there is widespread dissatisfaction with the curriculum among students, teachers, parents and even some members of the USSR Academy of Sciences (apparently the curriculum is so abstract that many teachers and students cannot handle it); and that the curriculum may have exacerbated the differences between eastern and western regions of the Soviet Union and between urban and rural areas. Nonetheless, Wirszup's general conclusion is that Soviet mathematics and science instruction far surpasses the training received by American students.

Wirszup's most commonly cited data deal with the number of years Russian students spend studying mathematics and science courses. In a letter to D. D. Aufenkamp and Joseph I. Lipson of the National Science Foundation, Wirszup states that virtually the entire young Soviet population receives the following compulsory mathematics and science education in grades 1–10 (the end of elementary and secondary education):[8]

3 years of arithmetic (grades 1–3)
2 years of arithmetic combined with algebra (grades 4–5)
5 years of algebra (grades 6–10)
10 years of geometry (grades 1–10)
2 years of calculus (grades 9–10; in the future, calculus may be taught in grade 10 only)
5 years of physics
4 years of chemistry
1 year of astronomy
5-1/2 years of biology

Wirszup contrasts these findings with National Science Foundation results which indicate that an average college-bound high school graduate in the United States has taken the following mathematics and science courses:

8 years of arithmetic and possibly 1 year of general mathematics
2 years of algebra (1 basic, 1 advanced algebra or trigonometry)
1 year of geometry
1 year of chemistry or physics, at most
1 year of biology

Wirszup concludes that a Soviet secondary school graduate entering a university or military academy, or a middle-level professional or skilled worker, has achieved the following advantages over American students:

1–2 years more training in algebra
8 years more training in geometry
1–2 years more training in calculus

TABLE 1
Curriculum in the Soviet
10-year General Education School

Subject	Number of hours per week by grade										Cumulative hours per week
	1	2	3	4	5	6	7	8	9	10	
1. Russian language	12	10	10	6	6	4	3	2	—	—	53
2. Literature	—	—	—	2	2	2	2	3	4	3	18
3. Mathematics	6	6	6	6	6	6	6	6	5	5	58
4. History	—	—	—	2	2	2	2	3	4	3	18
5. Soviet state structure & law	—	—	—	—	—	—	—	1	—	—	1
6. Social science	—	—	—	—	—	—	—	—	—	2	2
7. Nature study	—	2	2	2	—	—	—	—	—	—	6
8. Geography	—	—	—	—	2	3	2	2	2	—	11
9. Biology	—	—	—	—	2	2	2	2	1	2	11
10. Physics	—	—	—	—	—	2	2	3	4	5	16
11. Astronomy	—	—	—	—	—	—	—	—	—	1	1
12. Mechanical drawing	—	—	—	—	—	—	1	1	1	—	3
13. Chemistry	—	—	—	—	—	—	2	2	3	3	10
14. Foreign language	—	—	—	—	4	3	3	2	2	2	16
15. Fine art	1	1	1	1	1	1	—	—	—	—	6
16. Singing & music	1	1	1	1	1	1	1	—	—	—	7
17. Physical education	2	2	2	2	2	2	2	2	2	2	20
18. Workshop training	2	2	2	2	2	2	2	2	2	2	20
Total hours of compulsory subjects per week	24	24	24	24	30	30	30	31	30	30	277
19. Elective studies	—	—	—	—	—	—	2	4	6	6	18
TOTAL	24	24	24	24	30	30	32	35	36	36	295

Data Source: Izaak Wirszup, Appendix to testimony prepared for the U.S. Senate Subcommittee on Science, Technology and Space, April 20, 1981.

Apparently the new Soviet curriculum is too abstract for many teachers and students.

- 4 years more training in physics
- 3 years more training in chemistry
- 3-1/2 years more training in biology
- 1 year more training in astronomy

Wirszup observes that his comparisons measure *years*, not hours of instruction. However, he gives full credit for course material covered, irrespective of the number of hours spent in instruction during the year. Wirszup provides the data (which are included in appendices to his Senate testimony) with which to interpret his findings. A review of these data indicates that the comparisons between Russian and American students based on years of mathematics and science instruction offer a very exaggerated picture of the actual differences in time spent in these courses (see Tables 1 and 2, taken from Wirszup's Senate testimony).* The appropriate analyses should compare actual hours spent in instruction. The *hourly* data show that:

- Russian students spend 6 hours *per week* in mathematics instruction in grades 1–8 and 5 hours per week in grades 9–10. Since American students typically spend 5 hours per week per course, the Russians take the equivalent of approximately one American mathematics course per year. Wirszup's Table 2 shows a double counting of the time spent in mathematics instruction by subdividing the courses according to subject matter taught—which accounts for the high number of "years" Russian students are reported to spend in various mathematical courses. For example, ninth and tenth grade students spend 3 hours per week in a course called "algebra and *elements* of calculus" (emphasis added). Wirszup then counts this as 2 years of algebra and 2 years of calculus. Similar computations are used to arrive at total years spent in other subject matter areas.
- Russian students spend an average of about 2 hours per week in biology instruction in grades 5–10. In time spent, this is the equivalent of approximately 2 American courses over the 6-year period.
- Wirszup's data show that Russian students average about 3 hours per week in physics instruction in grades 6–10. This equals approximately 3 American courses.
- Russian students average about 2-1/2 hours of chemistry each week in grades 7–10, the equivalent of 2 American courses.

Much of the instructional time reported by Wirszup is spent in grades 1–7. It is likely that at least some of the material referred to as algebra, geometry, biology, chemistry, and physics in these grades is similar to subject matter contained in American elementary and junior high school general mathematics and science courses. We also may question, given our knowledge of children's abilities at various ages, whether the complexity of the material taught to Russian children in grades 1–7 is as great as Wirszup's conclusions would suggest. If grades 8–10 only are considered, Russian children receive the equivalent of approximately 3 mathematics courses, 1 biology course, 2-1/2 physics courses, and 2 chemistry courses. While these data suggest a greater emphasis on mathematics and science education in Russian than in American schools, especially in physics instruction where only 9% of American high school students take any course work at all, they do not support the large differences in *years* of instruction which are generally reported.

It is also interesting to note from Wirszup's data the number of hours spent by Russian secondary school students in non-science and mathematics courses. Although Russian students spend more time on foreign language instruction and workshop training than American students, they spend less time studying Russian language and literature, history, or social science, a choice which would perhaps be less than satisfactory to American educators (and parents) concerned with the overall quality of educa-

TABLE 2
Mathematics in the Soviet 10-Year General Education School

	Hours per week in grade:									
Subject	1	2	3	4	5	6	7	8	9	10
Arithmetic (with intuitive geometry)	6	6	6							
Mathematics (arithmetic, elements of algebra, and geometry)				6	6					
Algebra						4	3/4	4		
Algebra and elements of calculus									3	3
Geometry						2	3/2	2	2	2

Data Source: Izaak Wirszup, Appendix to testimony prepared for the U.S. Senate Subcommittee on Science, Technology and Space, April 20, 1981.

tion and the preparation of students to be informed citizens.

Wirszup's data are often used to support claims that the quality of mathematics and science education in the United States is declining. There is evidence that these areas need to be strengthened, particularly at the pre-college level. That issue should be considered on its own merits, however, and not in response to the alleged commitment and advances in other countries. It is important to maintain our perspective on the subject, especially in view of the empirical questions about some of Wirszup's conclusions. ■

NOTES

1. See, for example, *The Washington Post*, "Decline in Education: The Evidence," October 13, 1981; and "U.S. Math, Science Curricula Lack Rigor of USSR Versions, Wirszup Tells NSF," *Phi Delta Kappan*, April 1981.
2. Izaak Wirszup, Testimony prepared for the U.S. Senate Subcommittee on Science, Technology and Space, April 20, 1981, p. 2.
3. SRI International, *A Summary Report on the Educational Systems of the United States and the Soviet Union: Comparative Analysis*, Arlington, VA, March 1980; The National Science Foundation and the Department of Education, *Science and Engineering Education for the 1980s and Beyond*, Washington, D.C., October 1980; and "The Science and Math Gap," a series of articles in *Educational Leadership*, February 1981.
4. Izaak Wirszup, Letter to D. D. Aufenkamp and Joseph I. Lipson of the National Science Foundation, December 14, 1979; and Edward Esty, NIE staff memorandum, May 20, 1980.
5. Wirszup, Letter to D. D. Aufenkamp and Joseph I. Lipson of the National Science Foundation, *op. cit.*, pp. 9–13.
6. Wirszup, Appendices to testimony prepared for the U. S. Senate Subcommittee on Science, Technology and Space, *op. cit.*

American education: how are we doing?

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IDEOLOGICAL answers to the question posed by the title of this article have proliferated in recent decades, but adequate, integrated summaries of the vast accumulation of relevant empirical data have not kept pace, making it difficult to form independent judgments. This article is an attempt to make it less difficult by reviewing and reanalyzing available data on four of the most important questions about American education: How adequate are our educational resources and how fairly are they allocated? What are the cognitive achievement levels of our students in comparison to those of their foreign peers today and their domestic counterparts of yesteryear? What was the effect of open, versus traditional, schools on our students? And how has the American public assessed American education in recent decades?

Levels and distribution of spending

If the quality of schooling could be assessed by resources and resource allocation alone, America would lead the world. Per-capita public expenditures on education are higher in North America than anywhere else on earth: more than twice as high as in Europe or the Soviet Union, and well over ten times as high as in Latin America, Asia, or Africa. We also send greater percentages of our children to

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school for longer periods of time: In 1975, 86 percent of all North American youngsters between the ages of five and nineteen were enrolled in school, compared to less than two-thirds of the children of Europe and the Soviet Union, just over half of the children of Latin America and Asia, and a scant third of the children of Africa.[1] Differences in wealth account for some of the discrepancies between regions and between countries, but national priorities enter in as well. Thus, measured by per-capita GNP, Sweden was richer than the U.S. in 1975, and its per-capita expenditures on education were correspondingly higher; West Germany's per capita GNP was slightly below ours and its per-capita public expenditures on education were lower as well. Yet data reported by the International Association for the Evaluation of Educational Achievement (IEA) indicate that in 1973 those two countries spent only 4.4 and 3.6 percent of their respective GNPs on education; we spent 7.7 percent of ours.

Our money and our willingness to spend it bought us teachers with the highest level of formal education in the world. IEA data indicate that teachers in the United States had more years of post-secondary education than those of any of the other developed nations studied. Our money and our values also make us less selective, keeping a very large proportion of our total adolescent population in class full-time through the final year of secondary school. The retention rate for the United States was about 75 percent; Japan was next with at least 70 percent; followed, or perhaps surpassed, by Sweden and Russia, with at least 65 percent each. Other nations, including some communist ones, tended to be much more selective at this level. According to IEA researchers, Belgium, Israel, Ireland, Australia, France, Hungary, and Finland had retention rates that varied from 47 to 21 percent; England, Scotland, Italy, Chile, India, the Netherlands, New Zealand, and Thailand retained between 10 and 20 percent; West Germany and Iran kept only 8 or 9 percent. Students who leave school prior to the final year of secondary school in foreign countries are generally considered to have completed a period of education appropriate for nonprofessional jobs; in the United States, such distinctions are rejected as elitist, and students who depart early are called "dropouts."

At the college and university level, America's rejection of selectivity, in practice as well as in theory, is even more striking and unusual. In recent years, we graduated three-quarters or more of our secondary school students and sent 50 percent of them on to college—1.5 million out of a senior class of some 3 million. Available data suggest that no other western democracy came close; neither did any communist nation. Until very recently, the Soviet Union seemed to be graduating only about two-thirds of its secondary students and sending only about one in ten of them on to institutions of higher learning. Work by University of Chicago mathematician Izaak Wirszup suggests that in the last few years the Soviets' secondary school graduation rate has risen dramatically, but there has been no comparable increase in the number of Soviet students who go on to college, currently estimated at about one million.[2] China, insofar as available data enable us to judge, seems to be graduating less than 20 percent of its secondary students and to be permitting only about 5 percent of these—less than 1 percent of the entire age group—to enter institutions of higher learning. Thus, of some 6 million students who took the college entrance test in China in 1978, only about 290,000 were selected for postsecondary education, a selection ratio of about twenty to one.[3]

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[1] Robert M. Bjork and Stewart E. Fraser, *Population, Education, and Children's Futures* (Bloomington, Indiana: Phi Delta Kappa, 1980); Ruth L. Sivard, *World Military and Social Expenditures, 1978* (Leesburg, Virginia: WMSE Publications, 1978).

In addition to being numerous, America's college entrants were also quite representative of the population as a whole. As the 1970's ended, better than one half of them were women and better than 10 percent were black, percentages that correspond quite closely to each group's proportion of our total population. A substantial percentage of college entrants came from families with incomes below the national average. Black Americans from relatively impoverished families were even more likely than whites from similar backgrounds to be enrolled, and to ask for and receive financial aid to further their studies. In 1976, 70 percent of black and Hispanic freshmen received such aid, as compared to 52 percent of other students.

And although the United States has one of the least centralized systems of educational financing in the world, resource allocation is surprisingly even overall. Some social class differences remain at the primary and secondary school level, but regional differences are now minimal, and racial differences in resource allocation within regions appear to have been all but eliminated. Data from the massive Coleman report strongly support this conclusion, and more recent studies by other researchers confirm it. In the IEA sample, teachers in predominantly black schools had about as much experience and education as those in predominantly white schools, and spent about the same amount of time planning lessons and marking papers. Student-teacher ratios were also similar, and, when the availability of ancillary service personnel was taken into account, schools with high concentrations of black students appeared to have more librarians, reading specialists, and guidance counselors than predominantly white schools.[4]

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[2] Izaak Wirszup, "The Soviet Challenge," *Educational Leadership* 38 (February, 1981): 358-360.

[3] U.S. Office of Education, Robert D. Barendsen ed., *The 1978 National College Entrance Examination in the People's Republic of China*, (1969).

Achievement: international comparisons

Alas, the relationship between educational resources and measurable intellectual achievement is, at best, modest. Often the impact on what students actually learn seems small, debatable, or even nonexistent; here, America provides the most poignant example. Though we rank first on measures of resources and resource allocation, we are currently not first on any measures of intellectual achievement. This appears to be true whether we compare American students with their counterparts in other developed nations, or with their predecessors in this country.

Cross-national comparisons are especially noteworthy but have received relatively little attention. Until recently, technical problems precluded researchers from gathering meaningful data on mean achievement scores on the same tests in different countries, but beginning in the late 1950's an international group of psychometricians and education specialists, working first with UNESCO and later under the auspices of IEA, worked out a series of generally reasonable solutions to those problems. They emerged in the late 1960's and early 1970's with a series of international tests in eight subjects, available in as many as fourteen different languages. These tests and the results of IEA analyses based on them are described in a twelve-volume series of studies, consisting of eleven international volumes and one national report for the United States.[5] Three of the eight areas covered by the IEA tests involved basic subjects: mathematics, reading comprehension, and vocabulary. Three others sampled knowledge in the sciences, literature, and civics, and two more focused on foreign language facility, one using English for this purpose, the other using French. IEA science tests covered both biological and physical sciences, and included practical as well as theoretical questions. Although coverage was hardly exhaustive, it did seem broad enough to justify the conclusion of IEA president Torsten Husén: "Together with mathematics, these subjects cover practically all the principal academic subjects in the secondary curriculum." (Details on the IEA tests are given in the Appendix.)

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[4] Richard D. Noonan, *School Resources, Social Class, and Student Achievement* (New York: John Wiley & Sons, 1976).

[5] The first two volumes were written by Torsten Husén and published in 1967. Three more volumes were issued in 1973, authored by L.C. Comber and John P. Keeves, by Alan C. Purves, and by Robert L. Thorndike; four more were issued in 1975, authored by E. Glyn Lewis and Carolyn E. Massad, by John Carroll, by Judith V. Torney, A.N. Oppenheim and Russell F. Farnen, and by

How did American students fare? IEA researchers repeatedly disparage such questions, saying over and over again that they had no intention of fostering "an international contest" or an "educational Olympics." They imply that such comparisons are inherently inappropriate either because competition is bad in and of itself, or because such comparisons are politically sensitive, or because national samples are not perfectly comparable (due to differences in factors such as secondary-school retention rates). With regard to the first objection, it might be noted that, good or bad, competition among nations is ubiquitous, and there are, after all, worse things over which to compete. With regard to questions of "political sensitivity," the only proper conclusion is that researchers should consider themselves social scientists first and politicians second—if at all.

Unfortunately, IEA makes comparison among countries extremely difficult. Its data may be pure gold but they are buried in a forbidding mountain of mapless documents—twelve poorly integrated and confusingly numbered and renumbered volumes with no overall index or list of tables, and a host of other startling, selective technical omissions. The overall effect is to make it extremely difficult, not only for lay people but for technical experts as well, to make full use of this rich mine of comparative data.

To circumvent these difficulties, my strategy was to focus on rank-order differences among countries, using composite mean scores for each test in each country as the basis for the rank-ordering. No composite scores were offered by IEA researchers for the tests of English and French as foreign languages, but data that were provided suggest that reading comprehension scores in those lan-

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Gilbert F. Peaker; two more volumes were issued in 1976, authored by A. Harry Passow, Harold J. Noah, Max A. Eckstein, and John R. Mallea, and by David Walker. The final volume, the national report for the United States, was written by Richard M. Wolf of Columbia University and issued in 1977. Wolf's volume was published by Teachers College Press; all other volumes in the series are published by Wiley.

guages provide an adequate substitute; therefore, reading comprehension scores were used in the independent analysis discussed below. The results for the United States were these: Out of nineteen tests, we were never ranked first or second; we came in last three times and, if comparisons are limited to other developed nations only, the U.S. ranked at the bottom seven times. (Post hoc arguments for limiting comparisons in this way recur throughout the IEA volumes because the mean difference between the highest scoring developed nation and the average of the developing ones is approximately two standard deviations, twice the size of that between the highest and lowest scoring developed nation.)

With or without inclusion of the developing nations, it is not only at the extremes that American students did poorly, but all along the way. Our mean scores placed us in the bottom half of the rank-order distributions thirteen times and in the top half only six times. Underdeveloped nations participated in twelve of these tests and, though their scores are consistently and markedly lower than those of developed nations generally, students from Iran managed to surpass our students in vocabulary at age fourteen; students from both Iran and Chile did so at age eighteen and, although Thai students trailed us in science at age eighteen, the difference between their mean score and ours was less than that between our mean score and that of any developed nation.

Retention rates: explanation or excuse?

Do differences in secondary school retention rates largely explain the poor showing of American students, as IEA researchers claim? From the data published thus far, it is impossible to be certain, but t seems unlikely. IEA researchers were not exactly forthcoming in eporting secondary school retention rates in countries where those ates were most closely comparable to our own but, from data proided above, it appears that the two countries most similar to us in is regard are Japan, with a 70 percent retention rate, and Sweden, ith a rate of at least 65 percent. Japan participated in six tests, urpassing us all six times and surpassing all countries three times. s record, in brief, is first in three tests, second in one test, and last none. Sweden participated in eighteen tests in which we also paripated, surpassing us in twelve of them, placing first among all tions once, second twice, and last twice. This record is not as specular as Japan's but clearly superior to ours.

Other common arguments against comparing national samples focus on differences in emphasis given to different subjects in different countries; it is said that this makes cross-national comparisons all but impossible because students in different countries have not had equal opportunities to learn the material covered by the tests. Objections of this sort would seem to be relevant, however, only if someone were to use these data to try to answer questions about the innate intellectual potential of students in different nations, and no one has. The questions that have been raised, here and elsewhere, are not questions about what students in different nations are *capable* of learning; they are questions about what students in different nations have actually *succeeded* in learning and, with regard to American students in the 1960's and 1970's, the answer, from an international perspective, seems to be, "relatively little."

IEA researchers, while often oblique about such matters, nonetheless point to a much more sanguine conclusion. Richard M. Wolf, author of the national report on IEA results for Americans, presented what appears to be the strongest case for its conclusions, but his presentation is problematic in at least three respects. First, he echoed the claim, made throughout the IEA volumes, that differences in mean test scores between developed nations are almost entirely a function of differences in secondary school retention rates, allegedly because high retention rates are strongly associated with low mean test scores.

Accordingly, to assess fairly the effects of retention rates on test scores at the secondary level, it seemed desirable to examine data on the relationship between retention rates and test scores for secondary students in all 21 countries participating in the IEA study, and to count all students enrolled in the final year of secondary school in all nations, regardless of the curriculum in which they were enrolled. To do this, it was necessary to add data on retention rates in the four countries Wolf unaccountably omitted,[6] and also to correct the figure he gave for Sweden (45 percent) to make it consistent with that for other nations by including Swedish vocational students along with academic ones as other IEA researchers seem to have done in reporting retention rates for Sweden as, variously, 65 or 75 percent. To facilitate examination of the relationship between these corrected retention rates and test results, I rank-ordered every country according to the mean composite scores achieved by its secondary students on every exam in which those students participated. Spearman correlations were then computed for each of the nine tests taken by students in the final year of secondary school to examine the relationship between retention rates and achievement scores. When all 21 nations were included, none of the correlations proved significant; developing nations tend to have highly selective secondary schools. When only developed nations were included, seven of the nine correlations were still nonsignificant. Only two, those using scores from the reading comprehension and science tests, achieved significance, and Japanese students participated in neither.

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[6] Retention rates for three of the omitted countries—Japan, Israel, and Ireland—are reported elsewhere in the IEA volumes and my own investigation suggested that the single exception—Rumania—had a retention rate that surpassed our own. One could, perhaps, argue that some Rumanian students were in a vocational curriculum, others in an academic one, and that only students enrolled in the latter curriculum should be counted, but consistency would seem to require a more inclusive approach. American retention rates used throughout the IEA volumes do not appear to exclude students enrolled in vocational curricula, and data from a separate, large-scale survey of American students indicate that average enrollment in vocational curricula in our high schools is about 40 percent. (Inconsistencies among IEA researchers in this regard may also help to explain why some of the other retention rates they report, such as those for West Germany, seem artificially low.)

While high retention rates may depress some mean test scores at the secondary level, claims that this factor accounts for most of the variance in achievement are exaggerated and provide a false excuse for the relatively poor performance of American students. Beneath all the seeming complexity, the plain truth appears to be this: In the late 1960's and in the 1970's, American students did not perform as well as most of their peers in other developed nations, and their poor showing cannot be attributed mainly to the egalitarinism that makes us encourage large majorities of our students to finish high school.

Wolf and some of his IEA colleagues offer two other consolation prizes to Americans. They claim that in comparisons excluding secondary students, other nations score below the American mean more often than above it, and that estimates of the performance of the top 1 to 9 percent of the secondary school population show no real differences between countries.[7] The first claim is less impressive than it appears, and the data provided seem insufficient to insure a fair independent appraisal of this second point. If it is true, it is somewhat surprising in light of other, purely domestic data on the performance of American students over time.

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[7] To evaluate the significance of the first claim, I rank-ordered every country according to the mean composite scores achieved by its ten- to fourteen-year-old students on every test in which at least six nations participated. Twelve tests met this criterion; the United States participated in eleven of them and our mean scores place us in the bottom half of the distribution of six of them. It *is*, nonetheless, true that Wolf's first claim is technically correct, insofar as a total of 66 nations had means below ours and "only" 59 had means above ours on tests at these age levels. However, in appraising the meaningfulness of such counts, it seems worthy of note that 22 of the 66 nations we surpassed were underdeveloped ones. Among developed nations, only 45 had means below ours; 58 had

The history of American achievement

Comparisons of the intellectual performance of American students today with that of American students in the past are more common than cross-national comparisons. As a result, the major finding of domestic comparisons has received wide publicity: American high school students are learning a great deal less today than they did in earlier decades. Here, the prize for length of temporal reach must go to Alvin Eurich. In 1928, as a 25-year-old research assistant, Eurich prepared some of the earliest standardized tests of reading comprehension and vocabulary, and administered them to Minnesota high school seniors and to freshmen at the University of Minnesota. In 1978, he readministered the same tests to samples of students drawn from the same schools. The differences were "striking and highly significant" and revealed a marked decline in mean scores on both tests over time.

Of course, Eurich's temporal comparisons, like the international comparisons considered above, are complicated by differences in retention rates for different samples: In the 1920's, the proportion of American students who finished high school and went on to college was closer to that in underdeveloped nations today than to current proportions in this country. Our twelfth-grade retention rate was 17 percent in 1920 and below 10 percent in earlier decades. As a result, it is tempting to argue—as IEA researchers do—that the poor showing of American secondary students today is not a function of any absolute decline but merely reflects the democratization of higher education in the United States in recent decades. IEA researchers, however, seem to be the only ones who yield to that temptation, and even they are not unanimous in doing so. Eurich compared students whose scores placed them in the top 1 percent, then and now, and found that in 1978, no student scored above 75 on this test (a drop of 20 points from the highest scores in 1928)

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means above ours, even at the age levels at which American students turned in their best performances. That record is certainly less depressing than the one made by American secondary students, who were in the bottom half of the distribution on seven out of eight tests and at the very bottom of the distribution of developed nations on six of them, but it is not exactly a record to cheer about either.

and only 1 student out of 100 scored near 60 in 1978 (whereas 5 out of 100 did so in 1928). Other researchers, working with the Scholastic Aptitude Test (SAT) and with other national tests, also concluded that the decline in this country is manifest not only in lower proportions of high-scoring students, but in lower absolute numbers of them as well.

Published data from the SAT have a narrower time frame, spanning a quarter century rather than a half century, but there is much to be learned from the mean scores of the million or so American high school students who take this test each year. SAT data show that from the mid-1950's to the mid-1960's, the mean scores of American students showed little variation, ranging from 472 to 478 on the verbal reasoning section of the test, and from 495 to 502 on the mathematical reasoning section. However, in the second half of the 1960's both scores began to decline and continued to do so in every subsequent year, falling to 460 and 488 respectively by the end of that decade, and to 427 and 467 respectively by the end of the next one. The actual magnitude of the decline was somewhat greater than these figures indicate. Research on "scale drift" shows that the SAT itself was quite stable from 1941 to 1963 but suffered some downward drift from 1963 to 1973, making it somewhat easier to get higher scores after 1963 than before.[8]

It is still too soon to tell whether the decline will be halted in this decade, but data for 1980 were not encouraging: Scores fell again, to 424 and 466 respectively. Once again, the low scores of contemporary American students cannot be fully explained by pointing to differences in high school retention rates. First, the decline in mean scores has been accompanied by a decline in the absolute number of high-scoring students on the SAT as on the Eurich tests. Second, the great expansion in the percentages of American students who complete high school and go on to college took place in the 1960's; in the 1970's those percentages stabilized, but the decline in SAT scores did not. Instead, it accelerated.

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[8] Jeanne Chall's analysis of the difficulty of reading passages on the SAT reinforces this conclusion (Jeanne Chall, "An Analysis of Textbooks in Relation to Declining SAT Scores," College Entrance Examination Board, 1977). She found that in 1947 and 1955, those passages had a Dale-Chall corrected grade level of 13-15, but in 1962, 1972, and 1975, they had levels of only 11-12. Over the same period, the difficulty level of best-selling textbooks for eleventh grade students remained stable, with a corrected grade level of about 9-10, but striking differences in qualitative features suggest that the intellectual demands actually made on students in the more recent years were markedly lower. And there is some evidence that the reading levels required by typical college textbooks have also been lowered in recent years to accommodate poor readers at both two- and four-year colleges.

Achievement declines in the SAT were also followed by declines in mean scores on most of the liberal arts content examinations administered by the American College Testing Program (ACT). (These exams are taken by about a half million American high school students each year.) Results of special statewide SAT testing programs involving all students in the final high school years showed a similar pattern of decline and revealed, once again, that the decline is greater at the top of the distribution than at the bottom. Cognitive test results for samples of eleventh graders in the massive Project TALENT study, which included over 400,000 students in its 1960 sample, also showed a decline when a new sample of eleventh graders was given ten of the same tests in 1975. A similar decline was manifest when the reading comprehension test given to the 1960 TALENT sample was given to the 1972 National Longitudinal Study sample. Scores on the science, writing, citizenship, and social studies tests given to seventeen-year-old students by researchers for the National Assessment of Educational Progress (NAEP) also showed significant declines from the late 1960's to the mid-1970's, and results on the Iowa Tests of Educational Development were similar.

Overall, there are only two divergent findings from large-scale cognitive assessment studies using national samples of high school students, and both are easily reconciled with the unidirectional thrust of the studies reviewed above. The two apparently contradictory findings were reported by Project TALENT researchers, who found a slight rise in the reading scores of twelfth graders in the 1960-1970 period (prior to the decline manifest in their data in 1975), and by NAEP researchers, who made enthusiastic public pronouncements about a slight rise in basic literacy rates achieved by seventeen-year-old students between 1971 and 1975. Even if accepted at face value, the TALENT findings, taken as a whole, raise no questions about the reality of the decline, only about its timing. And sampling problems in the 1970 study make their data seem less reliable on that point than that of other researchers.[9] With regard to the NAEP findings, contradictions there are more apparent than real: NAEP's literacy test was designed to measure students' grasp of basic skills at a level far below that measured in the studies discussed above.

Overall, the evidence pointing to a decline in the cognitive achievements of American high school students in the last two decades is conclusive, and relatively few concerned Americans remain unaware of that fact.

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[9] Lauress L. Wise, "Project TALENT: Studying the Development of our Human Resources," *New Directions for Testing and Measurement* 2 (1969): 1-26.

Achievement declines in elementary school

Two other major findings about the intellectual performance of American students over time have, however, received much less publicity. The first is that there has also been a marked decline in cognitive achievement in elementary school, a decline that may rival that in high school. With these younger students, the retention rate fig leaf must be discarded altogether because there have been no major changes in the proportion of American students completing the eighth grade in the last two decades. Beginning in the 1960's, clear signs that these students were also learning less—at least in the second half of elementary school—began to appear.

Here, it is important to note that there is virtually unanimous agreement that there was no decline in achievement in the first half of elementary school in the 1960's or in the 1970's. Instead, there were improvements in many areas, and there may also have been some gains, even in the 1950's, despite the fact that the difficulty of first grade reading texts declined steadily over the entire 42-year span from 1920 to 1962. Beginning in about 1962, however, the downward drift of first-grade readers was reversed: These books became more challenging and began to stress phonics (a trend that accelerated after 1967 in response to research suggesting that it had probably been a mistake to abandon this method). Tougher readers, more phonics, the cheerful and useful omnipresence of "Sesame Street," and the increasing prevalence of preschool instruction in general (and of Head Start programs in particular) seem to have worked together to maintain and improve achievement levels in the early grades of elementary school throughout the last two decades.

The decline in student achievement scores over the last two decades first begins in about the fifth grade, and by the eighth grade it seems comparable in magnitude to declines at the high school level. Unfortunately, the record here is not as complete as that available for high school tests such as the SAT. No major publisher of elementary school tests has issued annual reports on the mean scores of American students over the last two decades, and no blue ribbon panel has been appointed to investigate declines in this area. Generally, the data that are publicly available are derived from periodic "renorming" studies which use large representative national samples. These provide excellent comparative data on test scores at two points in time—the year when the last standardization was done and the year when the restandardization took place—but little or no data on year-by-year changes between those two points. As a result, precise figures on rates of change on any one test over time are unavailable and, because each publisher acts independently of the others and no central coordination exists, that data are available for one test are not always available for another in the same form.

Still, it is usually possible to measure changes in scores by standard deviation units, and to derive average annual rate of change figures from them. Recently, Paul Copperman did this, using standardization data from four major tests in wide use in American elementary schools; by supplementing his data with previously published data on the SAT and ACT tests, it is possible to obtain approximate comparative data on the magnitude of changes in achievement levels at the end of elementary school and at the end of secondary school.[10] Those data strongly suggest—but do not prove—that achievement declines manifest in the eighth grade from the mid-1960's to the end of the 1970's were as great as the decline in twelfth grade achievement.

It is important to keep in mind that only the exact magnitude of the decline remains questionable. The decline itself is a reality, in the upper elementary years as in the high school years. And there is at least one other decline that merits serious attention in assessing the quality of American schooling today: The scores of female students dropped more steeply than those of male students in the 1970's, an anomalous finding for "the equal rights decade," but a reality nonetheless. The result is that, by 1980, the average male taking the SAT had a verbal score of 428 while the average female had a score of 420. On the mathematical part of the test, the average male score was 491 and the average female score was 443. The superiority of male performance in mathematics is a longstanding phenomenon, but it is distressing to see the gap widen as a result of further declines in female performance in this area. The gap on the verbal part of the test is smaller but just as distressing because it is a new development. Prior to 1972, females consistently outperformed males in this area and their edge here helped to reduce the overall gap produced by their lower mathematics scores.

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[10] Paul Copperman, "The Achievement Decline of the 1970's," *Phi Delta Kappan* 60 (1979): 736-739.

That edge was always a fairly modest one; it was wiped out in 1972 and has not reappeared since. Males outperformed females on both parts of the test in every year from 1972 to 1980.

Hard work

Spending on education, as shown above, does not seem to explain the overall drop in achievement; besides, the level of spending increased throughout the period of the score decline, and distribution became far more even. Thus, fashionable hypotheses about "school inputs" thought to be related to "outputs," such as achievement, shed no light on the problem. A number of less fashionable but nonetheless interesting hypotheses have also been advanced. Four possible determinants of achievement will be considered below: amount of homework, amount of class time spent directly on relevant school work, frequency of class attendance, and textbook demand levels. They are listed singly because that is how they usually appear in the research literature, as single variables discussed in separate studies, but it may well be that there is really only one important variable here—the hard work variable.

Evidence that hard work, as measured by the amount of homework students do, is related to cognitive achievement is especially clear in the IEA studies. IEA researchers seemed distressed by this finding—Robert L. Thorndike called it a measure of "grim effort" but conceded that it did "generally seem to add a little something further to prediction." In fact, it proved to be the single most powerful school variable in the entire IEA survey, not only as a predictor of achievement in reading, but in virtually every other subject studied. In many cases, it was just about the only school variable that *did* correlate with achievement. Wolf described the American situation this way: "Outside of the homework variable, there was little consistency in the results. A variable that showed an independent relationship with achievement in one subject at one population level often failed to appear in the analysis at another population level in the same subject." The positive relationship between homework and achievement held fast, however, not only in America but in all other nations studied as well. John B. Carroll, in the IEA volume on French, writes that Rumanian students' performance was outstanding, especially among fourteen-year-olds, surpassing that of American students by about a standard deviation: "Countries differ consistently over populations in the amount of school homework their students report doing. Rumanian students do more homework, apparently, than students in any other country. (On the other hand . . . Rumanian students get and need little help from their parents.)"

That, as it turns out, is a bit of an understatement. Thorndike, in an essay published two years after his book on reading comprehension, described the relationship between achievement and parental help with homework—as distinct from homework itself—more clearly: "It appears, in particular, that parents' help with homework is more an indication of childish ineptitude than of parental commitment. The correlation was negative practically without exception for all countries, all subjects, and all levels."[11] Homework really helps, but only if students do it themselves. Homework has not, however, been fashionable in America in recent decades: Students in the Project TALENT sample reported spending less time studying in 1970 than they had in 1960, and data from another recent study indicate that such self-reports are likely to contain significant overestimates of the actual amount of work done (particularly by low-achieving students).

Results for the other two measures of hard work—amount of class time spent on relevant schoolwork and frequency of class attendance—are similar. Additional data and analyses underlining the strength of the relationship between the actual amount of class time spent working directly on particular subjects, and student achievement gains in those subjects, can also be derived from a number of studies of teacher effectiveness. But of course, no organization of class time by teachers will help students who fail to attend class at all, and as Annagret Harnischfeger and David E. Wiley point out, pupil absence rates have increased steadily over the past decade, resulting in smaller average amounts of schooling for pupils.[12]

Even when they did come to school, pupils in recent decades have been less inclined to work hard there: Harnischfeger and Wiley's data also show a substantial decline in enrollment in academic courses in high school. The result is that even though more students than ever before go on to college, those students have had fewer courses in subjects such as general English and mathematics, and fewer still in demanding college preparatory courses such as algebra, foreign languages, and physics. Chall's work indicates that the courses they have had may well have been easier in recent decades than in earlier ones, course titles notwithstanding. Jeanne Chall analyzed changes in sixth and eleventh grade textbooks in history, literature, composition, and grammar from 1935 to 1975. Her work is especially interesting because she carefully distinguished between *difficulty levels* and *demand levels*; she found that while the former had remained more or less stable over time in these upper grades, the latter had declined sharply. (Difficulty levels were measured by means of quantitative word counts; demand levels were inferred from such qualitative features as degree of child-centeredness—as contrasted with subject-centeredness—amount of entertainment-oriented material, and difficulty of work requirements and expectations.)

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[11] Robert L. Thorndike, "The Relation of School Achievement to Difference in the Background of Children," in Alan C. Purves and Daniel U. Levine, eds., *Educational Policy and International Assessment* (Berkeley, California: McCutchan, 1975).

[12] Annagret Harnischfeger and David E. Wiley, *Achievement Test Scores Decline: Do We Need to Worry?* (St. Louis: CEMREL, Inc., 1975); Harnischfeger and Wiley, "Achievement Test Scores Drop. So What?" *Educational Researcher* 5 (1976): 5-12; Harnischfeger and Wiley, "The Decline of Achievement Test Scores: Evidence, Causes and Consequences," *TM Report* 79 (February, 1979).

Chall found that in earlier decades textbooks tended to be "relatively small books, straightforward and factual . . . meant to be read . . . and designed to impart information," and noted of a typical book of this period, "there seems to be no attempt to be 'child-related' . . . it does not try to entertain. The style of writing assumes that the child will reach for the material rather than having the material accommodate the child." In contrast, more recent books were found to "resemble encyclopedias on the outside and picture magazines on the inside, with illustrations on three out of four pages and a matching somewhat chatty style," and to be "written for and to the child," and to seem "to do almost everything for the child." These later books were child-centered to a degree that risked distorting the material presented, and entertainment-oriented in the extreme, featuring cartoons, songs, and little stories. With regard to work requirements and expectations, Chall found that the writing requirements in typical texts had dropped from 44 percent in 1936 to 4 percent in 1965. Most important for the purposes of this review, she found that student achievement levels in these upper grades were much more closely related to demand levels than to difficulty levels, a finding with an obvious explanation. After all, if students are not really required or expected to read their textbooks, then it really doesn't matter much how hard or easy they are.

Given these results, increased demand levels seem in order, along with more required courses, more homework, and stronger sanctions against absenteeism. Such measures might be expected to improve cognitive achievement levels for all students and to be particularly helpful to those from whom American society has expected too little—disadvantaged students in general and female students in particular. Such measures would inevitably reduce freedom and flexibility in the classroom and, for that reason, they have been denigrated by influential figures in education who claim they are likely to stifle student creativity and to reduce self-esteem and happiness. As a result, many American classrooms have been reshaped in the opposite direction in recent years.

Evaluating "open" education

The most influential reshapers of American schools in the 1960's and 1970's were proponents of "open education." In essence, this was a new name for an old approach that received its first, and in many ways it most persuasive, exposition from John Dewey. Dewey conceived of education as an active, self-directed discovery process, and felt that teachers could best assist it through informal interaction with individual students who would be free to pursue their own interests in their own way. Such an education, he argued, would foster healthy emotional and social development, as well as intellectual growth, and was therefore preferable to such traditional devices as fixed curriculum requirements, didactic lectures, restrictions on physical movement and on social intercourse, and external rewards and punishments (marks and grades).

These attractive but largely untested ideas aroused lively debate in the United States in the 1920's and 1930's, but in the 1940's and 1950's they fell into disrepute, only to be revived with a vengeance in the 1960's and 1970's by new groups of enthusiasts convinced that traditional American schools were senselessly repressive places in need of radical restructuring. Some of these new ideologues were self-styled neo-Marxists, others were Freudian extremists, but many of the most influential were pillars of the American establishment, armed with generous foundation grants and backed by distinguished advisory committees.

Charles Silberman's 1970 book, *Crisis in the Classroom*, exemplifies the extraordinary embrace of extremist rhetoric and messianic claims that became common among a significant segment of American intellectuals during this difficult period. Silberman, Director of the Carnegie study on the education of educators, claimed that:

> It is not possible to spend any prolonged period visiting public school

> classrooms without being appalled by the mutilation visible everywhere—mutilation of spontaneity, of joy in learning, of pleasure in creating, of sense of self. . . . Because adults take the schools so much for granted, they fail to appreciate what grim, joyless places most American schools are, how oppressive and petty are the rules by which they are governed, how intellectually sterile and esthetically barren the atmosphere, what an appalling lack of civility obtains on the part of teachers and principals, what contempt they usually display for children as children. And it need not be! Public schools can be organized to facilitate joy in learning and esthetic expression and to develop character in rural and urban slums no less than in the prosperous suburbs.

Silberman, like many others before and after him, was an uncritical admirer of developments in British primary schools in the 1960's, seeing in their adoption of our largely dormant progressive tradition a model for Americans to emulate, and a panacea for the sorts of youth problems that began to emerge in the 1960's. Research support for these extravagant denunciations and claims was noteworthy mainly for its absence, but Silberman and his supporters were not deterred. They urged the immediate, wholesale rejection of traditional educational methods, viewing their opponents as insensitive reactionaries, and insisting that the immediate, wholesale adoption of open education methods would foster joy and creativity in all students, and would be especially beneficial for disadvantaged ones.

As is often the case with genuine innovators, Dewey himself had been more cautious and pragmatic, arguing that the worth of any institutional innovation should be measured by its actual effects on those exposed to it. Happily, some of his contemporary followers took him seriously enough to do just that—notably Neville Bennett, an English educator sympathetic to open education but unwilling to accept rhetoric as an adequate substitute for the systematic study of demonstrable results. Bennett undertook such a study comparing the progress made by students of teachers committed to open education with that made by students of teachers committed to more formal approaches. His main findings were ably summarized by Jerome Bruner:

> The more formal the teaching, the more time pupils spend working on the subject matter at hand. And in general, though with some important exceptions, the more time pupils spend working on a subject, the more they improve at it—not a huge surprise, but one that grows in importance as one looks at the other results. For though it may come as no revelation that students in the more formal classrooms improved considerably more in reading and in mathematical skills than the less formally taught, it is much more revealing that pupils in informal set-

> tings did *not* do any better on their creative writing than their more formally instructed fellows.
>
> What of personality and teaching styles? Most pupil "types" progress better under more formal teaching. And particularly the insecure and neurotic pupil: he seems able to attend to work better, and harder, in a formal setting. Particularly for the unstable child, the informal setting seems to invite time-wasting activities—indeed, the "unmotivated," rather neurotic child, was found to work four times as much at his studies in a formal setting than in an informal one. Interestingly enough, the informal class seems to increase favourable attitudes towards school—but it also increases anxiety.[18]

Bennett's work was, of course, subjected to severe criticism by those who wanted to dismiss his findings on ideological grounds. Standing alone, it appeared vulnerable because his sample was not fully adequate to represent all British students, let alone all of their counterparts in this country and elsewhere. However, Bennett's work does not stand alone; his essential findings have been repeatedly confirmed by a host of other independent investigators working with children of widely varying ages and backgrounds in the United States, Canada, and Sweden, as well as in Great Britain. Again and again, they found that contemporary students in open classrooms made less intellectual progress on average than their more formally instructed peers, and emerged with no compensating gains in creativity or freedom from anxiety. Liking for school did seem to increase in a few instances, but so did anxiety and negative behavior. And not just among students: Teachers reported that open instruction was more anxiety-provoking for them, too.

Clearly, there is a close correspondence between these findings on open education and those on the relationship between hard work and achievement levels reviewed above, but two other possible interconnections also seem worthy of note. Bennett found that the two groups of students whose scholastic performance suffered most in open classrooms were abler students in general, and female students in particular—the same groups who had the greatest declines in SAT scores in this country in the last decade. Still, some open education does result in as much work and as much achievement as more formal methods, and it would be as irresponsible and destructive to pressure teachers who have achieved good results with informal methods to abandon them as it was to pressure teachers who had achieved good results with traditional methods to abandon them.

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[18] Jerome Bruner, Foreword to *Teaching Styles and Pupil Progress* by Neville Bennett (Cambridge, Mass.: Harvard University Press, 1976).

Indeed, if there is any single lesson to be drawn from the educational experiences of the past two decades, it is that self-righteous indignation or ideological enthusiasm about teaching methods is a weak substitute for solid research. Ideological pressures in education are especially destructive when they coincide with and reinforce other, more general, social pressures in the same direction. During the 1960's and 1970's, children in general and students in particular were often cast in the role of victim by establishment stalwarts as well as by gurus of the counterculture, and the effect of such exaggerated advocacy seems to have been destructive for young Americans.

That, at any rate, may help explain the fact that the decline in effort and achievement among American youth in the last two decades coexisted with a steeper and more general decline in responsible and constructive attitudes and behavior, a decline that is manifest in the sharp increase in youth narcissism, grandiosity, crime, addiction, pregnancy, and venereal disease rates over the same period of time. Evidence of this more general decline is overwhelming and provides a needed reminder of the fact that schools are only one of many influences on young Americans. As a result, it is as inaccurate to lay the whole responsibility for the increasingly serious youth problems of today at the schoolhouse door as it is to absolve educators of all responsibility for them. It is equally misguided to judge the potential utility of progressive education in all historical circumstances by its effects in an era when many teachers used it believed they were bringing liberation to the oppressed.

What the public wants

Fears have been widespread in education circles in recent years that the American public will respond to the serious, often tragic youth problems outlined above by scapegoating teachers, but these fears receive little support from opinion poll data.[14] The Gallup organization has been taking annual stock of American attitudes toward education since 1969, and their findings indicate that such fears are unwarranted. They show that although large majorities of Americans are deeply distressed by what is happening to young people today, they admit that they share the blame with the education establishment. The sense of shared responsibility for youthful failings is manifest in responses to questions about the test score decline, raised by Gallup pollsters in 1975 and 1976. Asked whether they believed the score decline meant that the quality of education was deteriorating, most Americans replied with a resounding "yes." But in giving reasons for the decline, they assigned a major share of responsibility to parents, to students themselves, and to society as a whole. Teachers were not spared, but they were hardly singled out: Their contribution to the decline was ranked fourth in importance in 1975 and fifth in 1976, well behind such factors as inadequate parental supervision and discipline, overpermissiveness in society generally, and a lack of interest and motivation on the part of students themselves.

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[14] George H. Gallup, *A Decade of Gallup Polls of Attitudes Toward Education, 1969-1978* (Bloomington, Indiana: Phi Delta Kappa, 1978). See also the eleventh and twelfth annual Gallup polls of the public's attitudes toward the public schools, published in *Phi Delta Kappan* 61, (1979): 33-46, and 62, (1980): 33-46. In the same 1980 issue, see also Stanley M. Elam and Pauline B. Gough, "Comparing Lay and Professional Opinion on Gallup Poll Questions" and Jerry Duea and Walter L. Bishop, "The PROBE Results: Important Differences in Public and Professional Perceptions of the Schools," pp. 47-52.

Overall, the correspondence between the public's view and the research evidence reviewed above is impressive. Data from both sources strongly suggest that we need to reexamine our ideas about what is beneficial to children and what is not, taking a fresh look at the role of structure, discipline, and demand levels in human development. Agreement that this is what is needed seems almost as widespread among teachers as it is in the nation as a whole. It is much less widespread among educators who work in nonclassroom settings and among media people who cover education. In these groups, enthusiasm for the educational approaches of the 1960's and 1970's remains high, but anxiety is growing. In the last decade or so, Americans have increasingly pressed for change within the public schools at the local level, and have voted against public schools that could not or would not change by moving their children into private schools, secular and religious, at a rapidly accelerating rate.

Public consensus on these issues is very high and is manifest in many ways. Representative national samples saw discipline as the single biggest problem facing the public schools in eleven of the twelve consecutive years of Gallup polling in this area. In the early and middle 1970's, problems centering on integration and busing ranked second in importance with the public, but in more recent years the major concern has been drug use. Concern about the adequacy of school facilities and resources, initially ranked among the top five problems, has not ranked among the top ten since 1975. It was replaced by concerns about poor standards and poor curricula. Such concerns ranked third in importance in the 1980 poll, superseded only by concerns about lack of discipline and drug use.

The curricular changes American adults want are also clear, and their reasons equally so. In their own experience, the high school subjects most useful to them in later life were those that increased their skills in reading, writing, and mathematics. Throughout the 1970's, whenever the question came up, between 87 and 98 percent put facility in these basics at the top of their lists of essentials for American students. Large majorities felt that students who had not mastered these skills should be denied promotion or graduation, and favored the use of tests to determine mastery for novice teachers are well as for students. Here too, public convictions are in close accord with the research data, data that repeatedly underline the cardinal importance of basic skills, and of reading comprehension in particular. IEA researchers put it this way:

> Performance in reading comprehension is a better predictor of performance in science or in literature than is achievement in science or in literature a predictor of achievement in the other 2 subjects. This finding merely identifies [what Thorndike called] the expected "central role of reading as a determiner of achievement in the more specific subject matter skills." The policy implication is that priority should be given to this enabling skill.

Arguments against this developing consensus and against the grass roots movement which embodies it—the back to basics, minimum competence movement—have come mainly from sophisticated critics (university professors, researchers, and fund dispensers in foundations and government agencies) who argue that the popular movement misses the point. Elementary level basic skills have not declined, they say, advanced ones have. It is true, as noted earlier, that the somewhat sketchy available data suggest that literacy at the lowest level—which is often referred to as functional literacy—does not seem to be declining, but it is useful to take a hard look at NAEP's own data in absolute terms rather than in purely relative ones.

In absolute terms, NAEP data show that a full 12.6 percent of all American seventeen-year-olds still enrolled in school in 1975 were grossly illiterate, unable to comprehend and respond correctly to very simple written instructions of the sort that are ubiquitous in everyday life in America or in any developed society and essential to the maintenance of such societies. Nearly half—44.4 percent—fell into an in-between category which I have elsewhere referred to as semiliteracy.[15] Among black students, the situation was even worse: 41.6 percent of them scored in the illiterate category, 82.7 percent in the semiliterate one. Worse yet, these figures represent significant underestimates of the actual magnitude of illiteracy among contemporary American teens because students who dropped out of school at age sixteen, about 20 percent of the total age group, were excluded from the NAEP sample.

Given these findings, the public's emphasis on basic skills and on the discipline necessary to attain them does not seem misplaced. Findings from the SAT and other secondary school tests indicate that hard work on basic skills at higher levels is also very much in order, as many state legislators and teachers and a small but growing number of researchers and educators have concluded. The evidence reviewed above strongly suggests that it is time to put aside attempted externalizations of blame along with other, more subtle, attempts to pretend that current problems in this area are not serious ones, and to join together in a concerted effort to solve them.

APPENDIX

IEA tests were available for anywhere from two to four different student populations defined by age (ten, thirteen, and/or fourteen) or by grade (the grade in which most thirteen-year-olds were enrolled and/or the final year of secondary school), creating a total of 21 tests that were administered to samples of students ranging in age from ten to nineteen in anywhere from six to eighteen countries. Of course, the match between exam content and curriculum content was not exact for any of the countries, but, once again, Husén's conclusion here seems apt: "With some justification, one might, paradoxically, say that the tests devised for the IEA study are equally appropriate or inappropriate to all the countries participating in the study." That equality was not as hard to achieve as some had feared. Gilbert Peaker summarized IEA data on this point as follows: "What is taught is very much the same from country to country. There are no very striking differences from country to country in the curriculum despite the differences in language and history." All the tests were presented in an objective, multiple-choice format for obvious reasons, but the foreign language tests also included subjectively scored free response subsections. Analysis of the resultant data led the author of the volume on the study of French to this conclusion: "The correlations between scores on the 'objective-type' tests and scores on free-response, subjectively scored tests are often so high that it is difficult to believe that testing procedure ('objective' vs. 'subjective') makes any practical difference in the results."

The participation of nations in the study was, of course, voluntary. Each nation had an opportunity to help design the tests and to reject any that it deemed unfair to its students. None of the 21 participating nations did so on all 21 tests, but several, including the United States, came close. The U. S. participated in everything except the testing of English as a foreign language, leaving nineteen tests on which it is possible to compare the performance of American students with that of a sample of their peers from around the world. Here too, coverage was hardly exhaustive but the IEA sample of developed nations—seventeen in all—is not a bad first approximation of the total population of the developed nations. Its most obvious shortcoming is that it includes only two communist nations, Hungary and Rumania. The sample for developing nations is also small—only four nations, Chile, Iran, India, and Thailand—but these four do, at least, circle the globe. IEA researchers managed to get large and reasonably representative samples of students from all 21 countries, testing more than a quarter million students in all. The U.S. sample included more than 30,000 students drawn from both public and private schools in urban and rural areas in all four geographic regions of the country. However, students from the southern region—an area where student achievement tends to be lower than in the rest of the country—were somewhat underrepresented. As a result, any sampling bias that may exist would tend to overstate rather than to understate the achievements of American students.

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[15] Barbara Lerner, *Minimum Competence, Maximum Choice: Second Chance Legislation* (New York: Irvington Publishers, Inc., 1980). Lerner reports data found in *Functional Literacy: Basic Reading Performance*, National Assessment of Education, 1976.

To Promote or Not to Promote?

As more and more students fail to meet toughened standards, educators are taking a new look at an old dilemma.

Frederic J. Medway

Nearly every state gives school improvement a top priority. Many have imposed higher academic standards, increased curriculum requirements, and instituted minimum competency tests to restore credibility to public school education. Given this push for greater achievement, what happens to the student who fails to meet the tougher standards? While some are singled out for special remedial help, the most convenient and widely used remedy is in-grade retention—making the student repeat the grade level. Deciding whether to retain and who to retain are among the most difficult decisions faced by principals.

Most schools follow, to varying degrees, the "grade standard" theory of promotion. This theory assumes that a school curriculum can be defined and ordered in a logical fashion across the grades, and that mastery of the curriculum can be measured. Grade progress depends primarily on such factors as test results and teachers' assessments of student achievement, and occasionally on attendance, rule conformity, and behavior.

Over the years, schools have fluctuated in their attitudes toward retention, and they have varied in emphasizing the grade standard as a determinant of promotion. At the turn of the century, when the grade standard was the rule, the average rate of retention for all grades was 16 percent. By the early 1930s, when schools began to give more consideration to the individual needs of the child, more

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flexible guidelines served to reduce the retention rate. It dropped to between 4 percent and 5 percent by 1940.

The 1960s saw the widespread adoption of the "social promotion." Instead of repeating grades they had failed, most students were promoted to the next grade, where they were grouped according to their ability and provided with individualized remedial instruction. Unfortunately, the recent decades of social promotion have been marked by precipitous drops in achievement test scores and an alarming rise in the number of high school graduates unable to meet minimum reading, writing, and computing standards.

Today, with most educators calling for reinstatement of strict, measurable promotion standards as part of a renewed emphasis on basic skills, there is no agreement on promotion policies. In 1980 my colleagues and I surveyed most of the school districts in South Carolina and found that just about half either had no official promotion policy or stated that their current policy was being reviewed.

In the same survey, we found that school districts with written policies tended to have flexible standards that used at least two of these four basic factors to decide whether a student would be promoted:

1. Achievement, usually defined in terms of a grade or percentile score relative to other students at the same grade.
2. Personal and home factors, such as chronological age, social maturity, physical development, and parental attitudes.
3. The number of times the student previously had been retained.
4. What administrators felt was "in the best interest of the student."

In many school districts, however, promotion policies are becoming increasingly rigid. A 1978 Gallup Poll revealed that more than two out of three respondents were in favor of promoting only students who passed an examination. More than 36,000 parents, teachers, and residents of Cleveland who were surveyed in 1982 said that students should not be promoted unless they mastered reading, writing, math, and other important subjects. Where once only small and rural school districts were prone to endorse rigid promotion standards, the practice is now commonplace in large, urban districts. In Chicago, students must pass 80 percent of key language arts objectives before leaving elementary school. Denver, Seattle, Atlanta, Washington, and New York City are some of the large cities now requiring minimum skill levels for promotion.

The New York City promotion policy for grades kindergarten through nine, one of the most comprehensive and specific in the nation, went into effect during the 1982 school year. An elaborate series of formal and informal diagnostic tests are used to ensure that students have mastered the essential content of each grade. In all grades except grade 4 and grade 7 there are recommended promotion standards that are left to the discretion of local schools to implement. In grades 4 and 7 there are required standards that students must meet in order to advance to the next grade. Here is how New York City's promotion policy works:

Kindergarten and Grade 1. It is recommended that each district develop its own programs for early detection, diagnosis, remediation, and/or retention of failing students.

Grades 2 and 3. It is recommended that students satisfactorily complete academic areas of study; score within one year of grade level on a standardized reading test; attain required performance standards in reading, writing, and mathematics; and show satisfactory attendance, punctuality, and behavior.

Grade 4. Students must meet the standards recommended for grades 2 and 3, and must score within two years of grade level on a standardized math test.

Grades 5 and 6. The grade 4 requirements are recommended.

Grade 7. The requirements are identical to those of grade 4 except that the standardized reading score must be not more than one and one-half years below grade level.

Grades 8 and 9. The grade 7 requirements are recommended.

Although official reports of national retention rates are not available, the United States Bureau of the Census does gather data on the number of children who are at or below the modal grade for their age (i.e., the grade in which most children of a given age are enrolled). Table 1 summarizes Census Bureau data on the percentage of children ages eight to 17 who were enrolled below the mode in 1950, 1960, 1970, 1976, and 1978.

Statistics Show a Trend

A sharp decline can be seen from 1950 to 1960, followed by a moderate decline from 1960 to 1970. This was the period during which social promotion was in vogue. However, starting in the late 1970s, enrollment below the modal grade begins to rise. In the two-year period between 1976 and 1978, the numbers of children enrolled below the modal grade doubled and quadrupled. In 1978 more than 600,000 eight-year-olds were enrolled one or more years below their modal grade. This represented an increase of nearly 400,000 children in two years. The late 1970s were, of course, the period when minimum competency testing programs began to grow in popularity.

Census Bureau reports also indicate that children are more likely to be enrolled below the mode if (1) they are black or Hispanic, (2) the household head had less

Table 1
Percentage of Children in the United States Enrolled Below the Mode

Age	1950	1960	1970	1976	1978
8	6.6	4.0	3.4	3.8	17.2
9	11.2	6.5	5.1	4.9	18.8
10	15.7	8.1	6.7	5.7	21.0
11	18.0	9.2	7.4	6.7	18.8
12	21.6	10.5	8.4	7.6	19.5
13	23.6	11.7	9.0	8.0	19.8
14	25.0	13.9	10.2	8.5	17.1
15	26.4	15.2	10.7	9.6	23.0
16	24.6	15.0	10.8	11.0	25.6
17	22.0	14.9	11.0	11.2	22.3

than 12 years of education, (3) the family income is below the poverty level, and (4) they live in a southern state. Boys are more likely to be retained than girls.

What does the future hold? As more and more communities make promotion contingent upon mastery of grade-level objectives, retention rates will climb markedly. The trend is already being seen. In Atlanta, for example, 18 percent of the first graders were not promoted to the second grade in the fall of 1981. This retention rate was four times greater than that in the fall of 1980. When the District of Columbia implemented its student progress plan in 1980, 32 percent of the primary-grade students were not promoted. School officials in Seattle reported holding back more than 1,100 elementary school students in 1983 because of a new policy barring social promotion.

A Second Chance for Retainees

However, grade retention rates may not stay at such high levels. Pinellas County, Florida, is a good example. Prior to introducing a stringent promotion policy, the county retained about 4 percent of all elementary school students. The year after the policy was implemented the rate soared to 12 percent, but after four years it stabilized between 6 and 7 percent. Several factors appear to account for this rise-and-fall phenomenon in Pinellas County and other school districts. First of all, most districts have structured remedial programs, and many of them allow retained students to retake the promotional tests. Many students are taking advantage of this "second chance" opportunity.

In addition, we are also seeing an easing of the standards themselves. Promotions granted by administrators following parental requests are increasing; schools are reluctant to retain students more than once; and new rules are being created. For example, in New York City, eighth-grade students who fail tests required for high school entrance may now enroll and attend high school—but cannot get diplomas.

Does grade retention work? There have been nearly 100 studies addressing this question, going all the way back to 1911. All the major reviews of these studies have concluded that *retention is an ineffective way of increasing children's school achievement and promoting their personal adjustment*. Let's examine the data.

In a typical study comparing elementary and junior high retainees with a matched group of promoted children, it has been reported that although both groups made academic progress, the promoted pupils typically made much greater gains. Roughly 85 percent of the promoted pupils were achieving at a normal rate, compared to about 35 percent of the retained pupils.

In examining the progress of retainees during their second year in the same grade, compared to their first year, an examination of more than 6,000 cases found that only about 20 to 35 percent of the retainees learn more in the second year—whereas upwards of 40 percent actually learn less.

Research clearly indicates that retention has little educational benefit for children beyond the sixth grade. The benefits are greatest in the first and second grades. Kindergarten experience greatly reduces the numbers of schoolchildren who are not emotionally ready for the first grade.

One final point. While research studies show that retained children are not better off academically than are promoted children, this conclusion only applies to children who do not receive special instruction. It has been demonstrated that, in all grades, students in compensatory education programs made greater gains than either retained or promoted students who were not given special help.

Many students are recommended for retention because they are judged to be socially immature. It is assumed that, given another year in a class where their level of maturity and assigned tasks coincide, they will "catch up." However, research to date has not indicated that retention per se provides a positive influence on a child's social adjustment.

With so little evidence in support of retention, why are so many children retained each year? There is no easy answer. One reason is political: the growing pressure on the schools for accountability. Another contributing factor is that nearly all retained children do make some progress in the repeated year—even though it is impossible to know if they would have made equal progress had they been promoted. Parents who feel that retention has helped one of their children are especially willing to allow another child in the family to be retained.

The children most likely to benefit from grade retention are usually young—typically first or second graders—who are not opposed to being retained, and whose parents accepted the decision and worked with their children at home. A recent study of successful first-grade retainees produced a profile of a child with a normal IQ who shows some academic progress in the first year of the grade, is emotionally well adjusted, and has or is developing appropriate social skills.

The Psychologist's Role

Who should make the critical decision to promote or not to promote? Ideally, such decision-making should be a team effort. In addition to the school principal, teachers, counselors, and parents, the team should include a school psychologist. The psychologist's role should be to ensure that the progress of every child is carefully monitored throughout the school year, and to determine as early as possible which children are "at risk" for failure.

The question of whether these children are potential candidates for nonpromotion then arises. There are really two issues to be considered here. The first is whether a child has an educational or developmental problem that can be served by special education. Simply put, if a child has an identified learning disability, is mentally retarded, or has a serious physical or emotional disorder, the services of a specially trained teacher are needed. For a child not suitable or eligible for special education, the second question must be addressed: Will retention be successful? To answer this question, the school psychologist might administer individual tests of intelligence, achievement, and adjustment; observe the child in the classroom; and conduct interviews with the child's teacher and parents.

The psychologist also should review the teacher's instructional efficiency and whether remedial strategies were attempted. If the student is not properly taught, nonpromotion is not only an injustice but a possible violation of student rights under the Fourteenth Amendment.

All of this information should then be weighed along with such data as the child's age, attendance patterns, opportunity to attend kindergarten or preschool, and family attitudes toward school in general and nonpromotion in particular. Throughout the data-gathering process the school psychologist should serve as ombudsman, communicating test results to parents, making sure they understand promotion policies and their legal rights, and allaying any anxieties.

If, after reviewing this information, it is decided that a child will be retained, the next question to be answered involves the curriculum that will be repeated, and how it should be taught. In nearly all cases the teacher must provide a special program if the retained student is expected to succeed, and the school psychologist now can serve an important function as consultant to teachers required to provide individualized programs of study.

Once it is decided that a student will not be routinely promoted with the rest of his or her class, perhaps the most important issue is what type of placement will have the greatest benefit for this particular child. So far, I have dealt with the two most common placement options—promotion to the next grade, or retention in the same grade. And I have used the term, retention, to indicate repetition of the subject matter by similar instructional means. However, there are a number of variations of traditional promotion and retention practices that deserve consideration.

One alternative is to promote the child and provide remediation within the grade level. A second alternative involves holding the student back and placing him or her in a special class with other retainees or "at risk" children for intensive remediation. This is the idea behind so-called transition classes for students who have completed kindergarten but are not ready for first grade. Research to date, however, indicates that promotion with remediation is preferable to transition instruction.

A third alternative also involves nonpromotion coupled with remediation; however, here the student can be promoted within the year upon demonstration of mastery of defined objectives. The New York City promotional policy is a variation of this. The policy requires special "promotional gates" classes in grades 4 and 7, with students moving into and out of the classes based upon their scores on skill tests. Students spend time in these remedial programs for reading, mathematics, or both.

A fourth alternative involves the use of partial promotions. In Greensville County, Virginia, some students are assigned to a "half-step" grade in elementary school, where only part of the curriculum is repeated.

Finally, many school districts, including New York City and Austin, Texas, have developed summer school programs for retainees. In the New York program, remedial classes are held for six weeks in July and August. Students are given 90 minutes of instruction in reading and/or 90 minutes in mathematics daily in classes of not more than 20 students that are taught by teachers who are prepared by about 16 hours of inservice training.

Decisions to hold students back in grade have and will continue to be difficult to make. Presently, schools are in a "no win" situation that is reaching critical proportions. They are being asked to balance the demands of local citizenry for educational accountability and advancement, based upon the attainment of specific academic objectives, with individual student needs and the knowledge that curriculum repetition helps only a few students.

There is no one approach that is best for all children. One thing, however, is fundamental. All of us must work for the interests of potential retainees, and must attempt to ensure that promotion decisions are made by individuals who are thoroughly familiar with the historical, scientific, and legal bases of grade retention. By doing so, we can greatly enhance the chances for successful academic and social development of students having difficulty in our schools. ☐

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The Application of Competency Testing Mandates to Handicapped Children

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Many states are facing the issue of how to apply minimum competency testing (MCT) mandates to handicapped students. In this article, Martha McCarthy considers the legality of MCT diploma requirements applied to the handicapped in light of (1) their constitutional and statutory rights to nondiscriminatory treatment, (2) their statutory right to an appropriate education, and (3) their constitutional right to substantive and procedural due process. She also offers a brief discussion of some unresolved legal issues surrounding the use of competency tests, including test validity, the controversy over individualized and standardized diploma requirements, and the identification of minimum competencies.

During the past decade, efforts have escalated to protect the constitutional and statutory rights of mentally and physically handicapped students in school settings. At the same time numerous states have instituted minimum competency testing (MCT) requirements to ensure that students who receive a high school diploma demonstrate mastery of designated competencies. This article focuses on legal issues associated with the convergence of these two developments.[1]

My central thesis is that handicapped students can be required to satisfy academic standards, including passage of an examination, to receive a high school diploma. Such children have a federally protected right to individualized *instruction*, designed to address their unique needs, but they are not entitled to individualized *diploma standards*. I will defend this position by examining the participation of handicapped pupils in

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[1] The alleged advantages and disadvantages of proficiency testing programs have received ample recent attention in educational journals and thus are not addressed here. See George Madaus, "NIE Clarification Hearing: The Negative Team's Case," *Phi Delta Kappan*, 63 (1981), 92-94; and, in the same volume, W. James Popham, "The Case for Minimum Competency Testing," 89-91; Diana Pullin, "Minimum Competency Testing and the Demand for Accountability," 20-22; and the entire issue of *Viewpoints in Teaching and Learning*, 56, No. 3 (1980), 1-124.

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MCT programs in light of their federal constitutional and statutory rights. While arguing that graduation requirements should be uniformly applied, I will also point out some unresolved legal issues associated with the use of proficiency tests as a diploma sanction.

Critics as well as advocates of MCT programs generally concede that the states and their agencies are empowered to establish requirements for grade promotion and high school graduation. Because education is among the powers reserved to the states under the Tenth Amendment, courts have deferred to state and local education agencies in establishing standards for pupil performance and in selecting the means to evaluate pupil progress.[2] In 1978 the U.S. Supreme Court distinguished an academic determination from a disciplinary action, noting that the former "judgment is by its nature more subjective and evaluative than the typical factual questions presented in the average disciplinary decision."[3] The judiciary has emphasized that school authorities "are uniquely qualified by training and experience" to assess academic performance and that the "efficiency of instruction depends in no small degree upon the school faculty's freedom from interference from other noneducational tribunals."[4] Noting that judicial restraint in academic matters is based upon sound public policy, in 1983 a New York appeals court declared that "the adoption of regulations with respect to graduation requirements, including basic competency examinations," is clearly within the state's authority to make a high school diploma meaningful.[5]

Although courts have endorsed the use of examination results with other data to award course credit or a diploma, they have also recognized that judicial intervention is warranted if academic standards are clearly arbitrary or unfair, if criteria are discriminatorily applied, or if students are not provided sufficient notice of requirements prior to the imposition of sanctions.[6] These allegations have been made in challenges to various MCT requirements as applied to the handicapped.

Currently, states that link MCT mandates to high school graduation do not have uniform procedures for dealing with handicapped pupils, that is, students who are receiving special education because of physical, mental, or severe emotional disabilities.[7] In some states, certain categories of mentally handicapped children are excluded from the MCT program and are awarded certificates of attendance in lieu of high school diplo-

[2] *See* Board of Curators of the University of Missouri v. Horowitz, 435 U.S. 78 (1978); Brookhart v. Illinois State Bd. of Educ. 697 F.2d 179 (7th Cir. 1983); Debra P. v. Turlington, 644 F.2d 397 (5th Cir. 1981); Mahavongsanan v. Hall, 529 F.2d 448 (5th Cir. 1976).

[3] Horowitz, 435 U.S. 78, 90 (1978).

[4] Connelly v. University of Vermont, 244 F. Supp. 156, 160 (D. Vt. 1965). *See also* Ennis v. Board of Regents of the University of Washington, 650 P.2d 1113, 1116 (Wash. App. 1982); Donohue v. Copiague Union Free School Dist., 391 N.E.2d 1352, 1354 (N.Y. 1979).

[5] Board of Educ. of Northport-East Northport Union Free School Dist. v. Ambach, 458 N.Y.S. 2d 680, 684 (App. Div. 1982).

[6] *See* Mahavongsanan v. Hall, 529 F.2d 448, 450 (5th Cir. 1976); Greenhill v. Bailey, 519 F.2d 5, 7 (8th Cir. 1975); Connelly v. University of Vermont, 244 F. Supp. 156, 159-61 (D. Vt. 1965).

[7] See Joseph Beckham, *Legal Implications of Minimum Competency Testing* (Bloomington, Ind.: Phi Delta Kappa, 1980), p. 22; National Association of State Directors of Special Education, *Competency Testing, Special Education, and the Awarding of Diplomas* (Washington, D. C.: Author, 1979). Throughout this article, the term "handicapped children" is used to refer to those who are mentally retarded, hearing impaired, speech impaired, visually handicapped, seriously emotionally disturbed, orthopedically impaired, other health impaired, or learning disabled so that they require special education and related services. For a definition of these terms, *see* The Education for All Handicapped Children Act of 1975, 20 U.S.C. § 1401(1),(15).

mas. In others, handicapped students are excused from the MCT requirement but are awarded regular diplomas based on successful completion of individualized educational programs (IEPs). In still other states, all pupils are required to pass the MCT to qualify for a high school diploma.

These diverse practices raise sensitive legal questions. If handicapped students are denied the *opportunity* to take a test to qualify for a diploma, are their federal rights to nondiscriminatory treatment impaired? If handicapped children are awarded diplomas without meeting standards that other students must satisfy, are the equal protection rights of the nonhandicapped violated? Can a handicapped child's educational program be considered "appropriate" if it does not include material covered on an MCT required for graduation? These questions are explored below in analyzing pertinent federal constitutional and statutory provisions and judicial interpretations of these mandates.

The Right to Nondiscriminatory Treatment

Handicapped individuals' federal protections against discrimination stem from both constitutional and statutory provisions. During the past decade, substantial litigation has involved interpretations of these mandates as they apply in school settings. Handicapped plaintiffs have used the equal protection clause of the Fourteenth Amendment and Section 504 of the Rehabilitation Act of 1973 to challenge numerous educational policies and practices, including MCT mandates.

Equal Protection Guarantees

The Fourteenth Amendment stipulates in part that no state can deny persons within its jurisdiction the equal protection of the laws. Several judicial tests have been developed to evaluate challenges to state action under the equal protection clause. If the governmental action affects a fundamental right (that is, an explicit or implicit constitutional right) or creates a suspect classification (such as race, alienage, or national origin), strict judicial scrutiny is applied.[8] Under this test, the state must produce a compelling interest to justify its action. In the absence of a fundamental right or suspect classification, courts traditionally have applied the rational basis equal protection test, which requires that the state action merely have a rational relationship to a legitimate governmental goal. Because of dissatisfaction with having to choose between the stringent "strict judicial scrutiny" or lenient "rational basis" tests, an intermediate or middle tier equal protection test has been applied in some cases by the Burger Supreme Court. This test requires that state action affecting a significant interest serve important governmental objectives and be substantially related to the achievement of those objectives.[9]

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[8] Fundamental interests include explicit constitutional rights, such as freedom of speech, and rights so closely related to constitutional guarantees that they are fundamental by implication, such as the right to vote in state elections. Classifications considered inherently suspect are those based on race, alienage, and national origin. For a discussion of the strict scrutiny, rational basis, and middle tier equal protection standards of review, see Martha McCarthy, "Is the Equal Protection Clause Still a Viable Tool for Effecting Educational Reform?" *Journal of Law and Education*, 6 (1977), 160-162, 178-181; Gerald Gunther, "The Supreme Court 1971 Term, Forward – In Search of Evolving Doctrine on a Changing Court: A Model for a Newer Equal Protection," *Harvard Law Review*, 86 (1972), 18-19.

[9] *See* Craig v. Boren, 429 U.S. 190, 197 (1976). Using this middle tier test, the Supreme Court has invalidated state legislation without identifying either a fundamental interest or a suspect classification. *See* Plyler

It seems highly unlikely that the judiciary will be persuaded to apply strict judicial scrutiny to challenges involving the application of MCT mandates to the handicapped. The Supreme Court has ruled that education is not a fundamental right under the Constitution.[10] The high court has not yet addressed the issue of whether the handicapped constitute a suspect class, but several lower courts have concluded that a classification based on handicaps is not suspect, and thus does not enjoy the preferred constitutional protection afforded to racial and ethnic minorities.[11]

Up to now, courts have relied on the traditional lenient rational basis equal protection test in evaluating handicapped students' challenges to MCT requirements. And consistently, allegations that the MCT programs are not rationally related to the advancement of legitimate state goals have been rejected.[12] It is well established that assurance of an educated citizenry is an appropriate governmental goal. Furthermore, the establishment of criteria to give value to a high school diploma is considered a rational means of attaining that goal. In 1982 an Illinois federal district court judge stated that "local boards of education and their staffs have the right, if not a positive duty, to develop reasonable means to determine the effectiveness of their educational programs with respect to all individual students to whom they issue diplomas."[13]

Although the judiciary has not yet been inclined to apply the middle tier test in equal protection claims involving the handicapped,[14] this intermediate standard may become more popular in educational cases. In a significant 1982 decision, the Supreme Court used the middle tier test to invalidate a Texas law that denied illegal alien children a free public education.[15] A narrow majority of the Court suggested that education is more important than other governmental benefits, and therefore, classifications affecting an individual's interest in receiving an education must be proved necessary to advance a substantial state goal.[16] In the future, students may rely on this decision in challenging conditions attached to the receipt of a high school diploma.

But there are significant differences between the denial of a diploma to students who do not satisfy academic standards and the total exclusion of a certain class of students from free public schooling. Texas was unable to produce evidence that any important governmental goal was advanced by denying an education to undocumented alien children. In contrast, states surely have a substantial interest in assuring that individuals who receive a high school diploma have met academic standards. Thus, it seems un-

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v. Doe, Texas v. Certain Named and Unnamed Undocumented Alien Children, 102 S.Ct. 2382 (1982); Frontiero v. Richardson, 411 U.S. 677 (1973); Reed v. Reed, 404 U.S. 71 (1971).

[10] San Antonio Independent School Dist. v. Rodriguez, 411 U.S. 1 (1973).

[11] *See* Matter of Levy, 345 N.E.2d 556, 558 (N.Y. 1976); Gurmankin v. Costanzo, 411 F. Supp. 982, 992, n.8 (E.D. Pa. 1976), *aff'd* 556 F.2d 184 (3d. Cir. 1977).

[12] Anderson v. Banks, 520 F. Supp. 472, 512 (S.D. Ga. 1981); Board of Educ. of Northport-East Northport Union Free School Dist. v. Ambach, 436 N.Y.S. 2d 564, 570-71 (Sup. Ct., Albany County, 1981), *aff'd as modified*, 458 N.Y.S.2d 680, 689 (App. Div. 1982).

[13] Brookhart v. Illinois State Bd. of Educ., 534 F. Supp. 725, 728 (C.D. Ill. 1982).

[14] In 1983 a New York appeals court specifically rejected the intermediate equal protection test in reviewing handicapped plaintiffs' challenge to an MCT requirement. The court reasoned that a policy requiring all recipients of a high school diploma to pass basic competency tests does not intentionally discriminate against handicapped students "so as to invoke the so-called 'middle tier' test. . . ." Board of Educ. of Northport-East Northport Union Free School Dist. v. Ambach, 458 N.Y.S.2d 680, 689 (App. Div. 1982).

[15] Plyler v. Doe, Texas v. Certain Named and Unnamed Undocumented Alien Children, 102 S.Ct. 2382 (1982).

[16] *Id.* at 2397-98.

likely that handicapped plaintiffs will succeed in challenging diploma standards—including passage of an MCT—on equal protection grounds, regardless of whether the rational basis or intermediate test is applied.

However, handicapped plaintiffs, like illegal aliens, have successfully used equal protection guarantees to challenge their total exclusion from public school or specific programs.[17] Accordingly, if certain categories of handicapped students are denied the *opportunity* to take an MCT and thus to qualify for a diploma, they would probably have a valid equal protection claim. No court to date has yet addressed this issue directly, but a Georgia federal district court judge in *Anderson* v. *Banks* did comment on it in dicta. The judge implied that the rights of handicapped children in Tattnall County, Georgia, had been compromised until the school district changed its former policy, which denied certain categories of handicapped pupils the opportunity to take the standardized achievement test used as a graduation requirement.[18]

Students have also successfully used the equal protection clause to challenge their misclassification and erroneous placement in special education classes. In *Anderson* the court found that some students classified as mentally retarded were deprived of regular academic instruction in the absence of proper placement procedures.[19] Concluding that the affected students' equal protection as well as federal statutory rights were impaired, the court ordered the district to submit a plan for reevaluating the students and designing a remediation program to enable misclassified pupils to acquire the knowledge necessary to satisfy MCT requirements.

In the absence of misclassification or denial of the opportunity to earn a diploma, it seems that handicapped students will not have as much success as have minority students in proving that MCT programs result in unconstitutional discrimination.[20] Indeed, in situations where the handicapped are automatically awarded diplomas without satisfying MCT requirements, the nonhandicapped who are denied a diploma because of failing the MCT may have a valid equal protection claim. They might successfully argue that the practice of giving a diploma to certain handicapped students who have not met the standards is not rationally related to the attainment of the state's objective, namely, establishing criteria to give meaning to a high school diploma.

Section 504

Handicapped individuals' federal entitlement to nondiscriminatory treatment is not confined to constitutional guarantees. Congress has elaborated on the rights of the handicapped through civil rights legislation. The most significant statutory protections are included in Section 504 of the Rehabilitation Act of 1973, which stipulates: "No otherwise qualified handicapped individual in the United States . . . shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance or under any program or activity conducted by any Executive agency or by the United States Postal Service. . . ."[81] Some handicapped students who have been denied a diploma because of failing an MCT have asserted that they have been denied a benefit made available to the nonhandicapped in violation of Section 504.

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[17] *See* Mills v. Board of Educ., 348 F. Supp. 866 (D.D.C. 1972); Pennsylvania Ass'n for Retarded Children v. Commonwealth, 343 F. Supp. 279 (E.D. Pa. 1972).

[18] 520 F. Supp. 472, 510 (S.D. Ga. 1981).

[19] *Id.* at 511-12. There have been several cases in which courts have enjoined the use of certain tests to place students in special education classes because of the racial or language biases included in the instruments. See Laura Pope, "Judicial Testing of IQ Tests," *Education Law Reporter*, 6 (1982), 875-877; David Kirp, "Student Classification, Public Policy, and the Courts," *Harvard Educational Review*, 44 (1974), 31-43.

[20] In both Debra P. v. Turlington, 644 F.2d 397 (5th Cir. 1981), and Anderson v. Banks, 520 F. Supp. 472 (S.D. Ga. 1981), minority plaintiffs were successful in securing an injunction to bar the use of an MCT requirement as a diploma sanction until the effects of past discrimination had been eliminated.

Several courts to date have considered this argument, and none has found it persuasive. In *Anderson*, the federal district court judge held that a school district's use of a standardized achievement test score as a condition of receiving a diploma did not constitute discrimination against the handicapped under Section 504.[82] The judge reasoned that Section 504 does not require the awarding of a diploma to handicapped students who have not met graduation requirements that might include passage of an examination. Noting that under Section 504 the handicapped are protected from discriminatory treatment, the judge concluded that they are not entitled to receive *all benefits* that the nonhandicapped receive. The following Section 504 regulation supports the court's holding: "Benefits and services, to be equally effective, are not required to produce the identical result or level of achievement for handicapped persons, but must afford handicapped persons equal opportunity to obtain the same result, to gain the same benefit, or to reach the same level of achievement. . . ."[83]

The judge in *Anderson* reasoned that a diploma policy based on the passage of an examination is no more discriminatory toward the handicapped than is a policy requiring a designated number of Carnegie units for high school graduation. He stated that if diploma standards were waived for the handicapped, the purpose of an MCT program, which is to certify competence, would be thwarted. However, the judge suggested that if certain handicapped children were denied the opportunity to qualify for a diploma, Section 504 would be violated.[84]

More recently, in *Board of Education* v. *Ambach*, a New York appeals court also ruled that withholding a handicapped student's diploma because of inability to satisfy competency standards does not constitute denial of a benefit solely by reason of a handicap.[85] The court affirmed the trial court's conclusion that Section 504 requires the provision of an appropriate education for the handicapped but does not guarantee that all handicapped children "will successfully achieve the academic level necessary for the award of a diploma."[86]

The court reasoned that under Section 504, educational institutions must make programs available and accessible to the handicapped, but they are not required to assure that all handicapped individuals attain their educational goals. The appeals court concluded that a Section 504 violation "arises only when benefits are denied to an individual who is able to meet all of a program's requirements in spite of his handicap."[87]

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[81] 29 U.S.C. § 794.
[82] 520 F. Supp. 472, 509-11 (S.D. Ga. 1981).
[83] 45 C.F.R. 84.4(b)(2).
[84] 520 F. Supp. at 510.
[85] Board of Educ. of Northport-East Northport Union Free School Dist. v. Ambach, 436 N.Y.S.2d 564 (Sup. Ct., Albany County, 1981), *aff'd as modified*, 458 N.Y.S.2d 680, 684 (App. Div. 1982).
[86] *Id.*, 436 N.Y.S.2d at 569.
[87] *Id.*, 458 N.Y.S.2d at 684.

The New York appellate court relied on the Supreme Court's reasoning in *Southeastern Community College* v. *Davis*. This case involved a hearing-impaired applicant who had been denied admission to a nurse's training program. The Court stated in *Davis* that Section 504 "does not compel educational institutions to disregard the disabilities of handicapped individuals or to make substantial modifications in their programs to allow disabled persons to participate."[88] The Court indicated that if the handicap itself prevents the individual from participating in the program, the person is not "otherwise qualified" under Section 504. Applying this logic, the New York appeals court concluded that substantial modifications in graduation standards are not required for students who, because of mental deficiencies, cannot pass a proficiency test.

In January 1983 the Seventh Circuit Court of Appeals became the first federal appellate court to address the rights of handicapped children when an MCT is used as a prerequisite to a high school diploma. In *Brookhart* v. *Illinois State Board of Education*, the appeals court found that the Peoria, Illinois, School Board had provided handicapped plaintiffs insufficient notice of the MCT requirement, but it agreed with the federal district court's conclusion that such a requirement does not violate the rights of the handicapped under Section 504.[89] The appeals court declared that altering the content of the MCT to accommodate mental disabilities would constitute "a 'substantial modification' as well as a 'perversion of the diploma requirement'."[90] Exhibiting deference to local school authorities in making educational decisions, the court recognized that the "school district's desire to ensure the value of its diploma by requiring graduating students to attain minimal skills is admirable."[91]

However, the appellate court held that Section 504 entitles physically handicapped students to modifications in the test format and environment to ensure that they have the opportunity to demonstrate their actual knowledge. It approved the district court's instructions that school officials make appropriate accommodations in the test administration in order to minimize the effect of children's physical impairments.[92] Thus, Section 504 has been interpreted as protecting handicapped children from discrimination in the *administration* of an MCT program, or any other testing program for that matter. But it does not assure a handicapped child that a diploma will be awarded if academic standards have not been satisfied.

The Right to an Appropriate Education

In addition to enacting legislation to protect the handicapped from discriminatory treatment, since the late 1960s Congress has passed several funding measures to assist state and local education agencies in providing educational services and programs for handicapped children.[93] Congressional efforts culminated in the Education for All

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[88] 442 U.S. 397, 405 (1979).

[89] 534 F. Supp. 725 (C.D. Ill. 1982), *rev'd* 697 F.2d 179 (7th Cir. 1983). *See* text with note 57 for a discussion of the due process issue.

[90] 697 F.2d at 184, citing 534 F. Supp. at 728 and Southeastern Community College v. Davis, 442 U.S. at 413.

[91] 697 F.2d at 183.

[92] *Id.* at 184. *See* 534 F. Supp. 725, 729, n. 5 (C.D. Ill. 1982).

[93] For example, in 1966 the Elementary and Secondary Education Amendments (P.L. 89-750) authorized federal grants to assist states in the initiation, expansion, and improvement of programs for handicapped pre-

Handicapped Children Act of 1975 (EHA). States participating in EHA funding are obligated to provide a free appropriate public education for handicapped children and to educate such students with the nonhandicapped to the maximum extent feasible.[84]

Congress did not prescribe the specific elements of an appropriate education. Instead, it stipulated that an individualized educational program (IEP) must be developed for each handicapped student by a planning team composed of regular and special educators, the child's parents or guardian, and the child, when appropriate. The IEP is expected to provide for special education and related services, including transportation and such developmental, corrective, and other supportive services necessary for the child to benefit from the special education. The law also prescribes elaborate procedural safeguards for handicapped children and their parents.

Increasingly, courts have been called upon to assess whether educational programs proposed by local school districts are appropriate for specific handicapped children. Some courts have interpreted EHA mandates quite broadly, thus placing responsibilities on public schools that are not prescribed in the legislation itself. For example, school districts have been judicially required to provide psychotherapy, catheterization services, and extended-year programs for handicapped children, even though EHA does not specifically mandate such services.[85] Lower court interpretations of the federally mandated appropriate education for the handicapped have spanned the continuum from an "optimum" to a "minimally adequate" program.[86]

In June 1982 the Supreme Court delivered its first opinion interpreting the obligations of state and local education agencies under EHA. In *Board of Education of the Hendrick Hudson Central School District* v. *Rowley*, the six-member majority concluded that handicapped children are not entitled to a particular level of education or to guaranteed outcomes, but rather to personalized instruction "with sufficient supportive services to permit the child to benefit from the instruction."[87] The Court reversed the appellate court's conclusion that EHA requires the state to provide educational services to maximize the full potential of handicapped children commensurate with the opportunity provided for the nonhandicapped. Noting that the opportunities offered to students vary depending "upon a myriad of factors that might affect a particular student's ability to assimilate information presented in the classroom," the majority reasoned that EHA "poses no clear obligation upon recipient states beyond the requirement that handicapped children receive some form of specialized education."[88]

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school, elementary, and secondary pupils. Also, the Handicapped Children's Early Education Assistance Act of 1968 (P.L. 90-538) authorized preschool and early education programs for handicapped children.

[84] 20 U.S.C. § 1401 *et seq.*

[85] *See* Armstrong v. Kline, 476 F. Supp. 583 (E.D. Pa. 1979), *modified and remanded*, 629 F.2d 269 (3d Cir. 1980), *cert. denied sub nom.* Scanlon v. Battle, 101 S.Ct. 3123 (1981); Tatro v. State of Texas, 625 F.2d 557 (5th Cir. 1980); North v. District of Columbia Bd. of Educ., 471 F. Supp. 136 (D.D.C. 1979); Matter of "A" Family, 602 P.2d 157 (Mont. 1979).

[86] *See* Springdale School Dist. v. Grace, 494 F. Supp. 266 (W.D. Ark. 1980), *aff'd* 656 F.2d 300 (8th Cir. 1981); *vacated and remanded*, 102 S.Ct. 3504 (1982); Armstrong v. Kline, 629 F.2d 269 (3d Cir. 1980); Rowley v. Board of Educ. of the Hendrick Hudson School Dist., 632 F. 2d 945 (2d Cir. 1980); Kruelle v. Biggs, 489 F. Supp. 169 (D. Del. 1980); Age v. Bullitt County Public Schools, 3 EHLR 551:505 (W.D. Ky. 1980), *aff'd* 673 F.2d 141 (6th Cir. 1982).

[87] 483 F. Supp. 528 (S.D.N.Y. 1980) *aff'd* 632 F.2d 945 (2d Cir. 1980), *rev'd and remanded*, 102 S.Ct. 3034, 3042 (1982).

[88] *Id.* at 3045, 3047.

Furthermore, the Supreme Court majority cautioned the judiciary against substituting its judgment for that of local planning teams in determining the *substance* of an appropriate education for handicapped children. The majority clearly restricted the judicial role to reviewing procedural violations under EHA. If a school district is providing a handicapped child with specialized instruction in conformance with an IEP and adhering to EHA's procedural requirements, the Supreme Court majority declared that the judiciary "can require no more."[39]

In light of the *Rowley* decision, it seems unlikely that handicapped plaintiffs will be successful in challenging MCT requirements under EHA. The Supreme Court rejected the assertion that EHA requires "strict equality of opportunity or services" and declared that such a requirement would "seem to present an entirely unworkable standard requiring impossible measurements and comparisons."[40] Thus, it appears that a child who has received special instruction to address unique deficiencies, instead of instruction necessary to pass an MCT, will not be able to rely on EHA in contesting the diploma prerequisite.

Even before the *Rowley* decision, the trial court in *Ambach* observed that EHA's mandate of appropriate educational opportunities is an input, not an output, standard. The court reasoned that the law specifies procedural safeguards to assure that an appropriate education is made available to handicapped children, but it does not mandate specific *results*.[41] On appeal, the New York appellate court reiterated that EHA does not require the award of diplomas to handicapped pupils who are unable to meet minimum competency standards.[42]

Similarly, the Seventh Circuit Court of Appeals in *Brookhart* held that "the denial of diplomas to handicapped children who have been receiving the special education and related services required by the Act [EHA], but are unable to achieve the educational level necessary to pass the MCT, is not a denial of a 'free appropriate public education.' "[43] The court further rejected the contention that an MCT requirement violates the EHA regulation stipulating that no single criterion can be the sole basis for determining an appropriate educational program for a handicapped child.[44] The court noted that the MCT is not the sole criterion for receiving a diploma in the Peoria School District because students must also earn a prescribed number of course credits and complete state curricular requirements.

However, competency tests used with the handicapped might be vulnerable to legal challenge under EHA (and Section 504 as well) if they have not been validated appropriately. Under the federal regulations, tests used in the evaluation and placement of handicapped children must be validated for the specific purpose for which they are used and must be selected and administered to "accurately reflect the student's aptitude or achievement level or whatever other factors the test purports to measure, rather than reflecting the student's impaired sensory, manual, or speaking skills. . . ."[45] Although these requirements are directed toward tests used in placing handicapped children in instructional programs, it seems that similar assurances of validity would be required for examinations used to withhold an educational benefit, such as a high school diploma, from a handicapped student. In *Brookhart*, plaintiffs asserted that both EHA and Section 504 require tests to be validated separately for the handicapped. However, the Seventh Circuit Court of Appeals declined to address whether the proficiency tests in question had been properly validated, reasoning that it could decide the case without issuing "a broad order . . . that might affect the validity of the MCT for all handicapped students."[66]

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[39] *Id.* at 3051.

[40] *Id.* at 3047.

[41] 436 N.Y.S.2d 564, 570 (Sup. Ct., Albany County, 1981).

[42] 458 N.Y.S.2d 680, 685 (App. Div. 1982).

[43] 697 F.2d 179, 183 (7th Cir. 1983).

[44] *Id.* *See* 20 U.S.C. § 1412(5)(c); 34 C.R.F. § 300.532.

[45] 34 C.F.R. §§ 104.35(b)(3) and 300.532(c)(3).

Fourteenth Amendment Due Process Guarantees

The Fourteenth Amendment provides in part that the state cannot deprive citizens of life, liberty, or property without due process of law. The Supreme Court has recognized both procedural and substantive components of federal due process protections.[67] If a state contemplates depriving a person of life, liberty, or property, certain procedural steps must be followed. At a minimum, the individual is entitled to proper notice, an opportunity to be heard, and a hearing that is conducted fairly.[68] In addition, the Court has recognized a substantive due process right in that governmental action threatening life, liberty, or property must be based on a valid objective and the means used must be reasonably calculated to achieve that objective.[69] In essence, individuals have a substantive protection from arbitrary state action that infringes upon their rights and a procedural protection to ensure that when such deprivations are imposed, they are imposed in a fundamentally fair manner.

In *Goss* v. *Lopez* the Supreme Court recognized that all states through their constitutions and laws have created a property right to attend school.[70] This entitlement cannot be denied to an individual without procedural due process. The Court also concluded that the denial of school attendance imposes a stigma on a student, thereby impairing a liberty right, which implicates the due process clause. Noting that even a short-term suspension from school may affect a student's future educational and employment opportunities, the Court held that procedural due process is required to ensure that the suspension is warranted and imposed fairly.

The seminal issues in connection with MCT requirements are whether students' property and liberty interests in attending school encompass the receipt of a high school diploma, and if so, what procedural protections must be afforded before a diploma can be withheld. While the prevailing judicial view is that the denial of a diploma, like the denial of school attendance, must be accompanied by procedural safeguards, the scope of students' rights in this arena remains ambiguous. In both *Ambach* and *Brookhart*, the appellate courts differed significantly from the trial courts regarding what due process rights of handicapped students are at stake when diplomas are conditioned on passage of an MCT.

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[66] 697 F.2d 179, 184 (7th Cir. 1983).

[67] See Kern Alexander, *School Law* (St. Paul: West, 1980), p. 343-345.

[68] *See* Goss v. Lopez, 419 U.S. 565 (1975); Morrissey v. Brewer, 408 U.S. 471 (1972); Goldberg v. Kelly, 397 U.S. 254 (1970).

[69] *See* Harrah Independent School Dist. v. Martin, 440 U.S. 194 (1979); Shapiro v. Thompson, 394 U.S. 618 (1969); Meyer v. Nebraska, 262 U.S. 390 (1923).

[70] 419 U.S. 565 (1975).

The New York trial judge in *Ambach* ruled that two handicapped children had a legitimate expectation of receiving a diploma, and therefore, "the diploma represents a property interest for the purposes of due process protection."[61] The judge noted that the state had revised its standards in 1979 to stipulate that handicapped pupils must pass a competency examination to receive a diploma, but the instructional programs for these students had been designed to address their IEP goals, and not necessarily the required competencies. Thus, the judge concluded that school officials had created an expectation on the part of handicapped pupils that successful completion of their IEPs would result in the receipt of diplomas. He also reasoned that students' liberty rights are impaired if they are labeled incompetent and denied a high school diploma because of their scores on an examination. Finding both liberty and property interests involved, the judge concluded that three years' notice of the MCT requirement was inadequate to satisfy due process mandates. Accordingly, he ordered the award of diplomas to the two mentally handicapped plaintiffs. He indicated that early notice of graduation requirements is particularly critical for handicapped children to allow proper consideration of whether the goals of the students' IEPs should include preparation for the MCT and to afford "appropriate time for instruction aimed at reaching that goal."[62]

However, the New York appellate court disagreed with the trial court's analysis of the due process issue in connection with the mentally handicapped plaintiffs. The appeals court declared that neither property nor liberty interests were implicated by the state's application of the MCT requirement to students who were not capable of pursuing a course of studies that would prepare them to pass the basic skills test.[63] Reasoning that no amount of notice would enable these students to pass the tests, the court rejected the assertion that the school district's prior practice of awarding diplomas based on successful completion of IEPs created a valid expectation that a diploma would be awarded as long as individualized objectives were satisfied. The court declared that to view these students as having a legitimate expectation that would rise to the level of a property right to a diploma "is to ignore reality" and to reject well established law that "a diploma is a credential, by which the conferring institution certifies that the recipient possesses all of the knowledge and skills expected of individuals who have been exposed to a rigorous academic discipline."[64] The court also concluded that students' liberty interests were not compromised because there was no false stigmatizing statement issued by a public entity. At most, the students are identified as "not having met the requirements for a high school diploma, which is true."[65]

Yet, the New York appeals court did recognize that some handicapped children who are capable of mastering the subject matter on the MCT might have due process rights at stake. Evidence conceivably could be presented to show that with sufficient advance warning of the MCT requirement, IEPs could be designed to prepare some children with remediable mental conditions to pass the tests. The court reasoned that such students might have a legitimate property interest in a diploma, necessitating procedural protections. But, unlike the trial court, the appeals court was not convinced that these students are entitled to notice of graduation requirements before they leave elementary school. Reasoning that three years' notice satisfies the due process clause, the court observed that it is not "of such brief duration so as to prevent school districts from programming the IEPs of such children to enable them to pass the basic competency tests. . . ."[56]

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[61] 436 N.Y.S.2d 564, 572 (Sup. Ct., Albany County, 1981).
[62] *Id.* at 575.
[63] 458 N.Y.S.2d 680, 686-87 (App. Div. 1982).
[64] *Id.* at 686.
[65] *Id.* at 687.

Two weeks after the New York appellate decision, the Seventh Circuit Court of Appeals in *Brookhart* found that eighteen months' notice of an MCT requirement was constitutionally inadequate because it did not allow enough advance warning for MCT objectives to be incorporated into IEPs.[57] The lower court had considered the notice sufficient, reasoning that it is a "misunderstanding and debasement of the concept of due process of law" to suggest that graduation standards must be waived for those who because of mental deficiencies cannot achieve them.[58] However, the appeals court held that since liberty and property interests are implicated when new requirements are attached to the receipt of a high school diploma, students are entitled to procedural safeguards. The court declared that denial of sufficient notice of the requirements "would make denial of a diploma and its attendant injury to reputation fundamentally unfair."[59] Acknowledging that the due process clause entitles students only to adequate *notice* of graduation standards and not to the *diploma* itself, the court recognized that it would be impossible to provide a procedural remedy for the eleven handicapped plaintiffs who had already finished school. Thus, the court ordered the award of diplomas to these students who had satisfied graduation requirements except for passage of the MCT.

The appellate court rejected the district court's conclusion that the "only possible reason" for handicapped students' lack of exposure to material covered on the MCT is their inability to grasp the material. Noting that some of the handicapped plaintiffs passed portions of the MCT, the court reasoned that the school officials' decision to require all but trainable mentally handicapped children to take the MCT at least once suggests a reluctance "to speculate on the innate abilities or limitations of their students."[60] The court referred to expert testimony "that predicting whether a child has the ability to pass 'is something that a responsible professional would not do.' "[61]

Relying heavily on the trial court's reasoning in *Ambach*, the Seventh Circuit Court of Appeals recognized that lengthy notice of an MCT is particularly important for the handicapped to provide time for reasonable consideration of whether their IEP goals should be altered to include material on the MCT. However, the appeals court did not specify how much notice would be considered constitutionally adequate. Instead, the court stipulated that school districts must either ensure that disabled students are exposed to the material on the test or substantiate that the pupils' parents and teachers have made a "reasoned and well-informed decision" that an alternative program is more appropriate for them.[62]

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[56] *Id.* at 688.
[57] Brookhart v. Illinois State Bd. of Educ., 697 F.2d 179, 187 (7th Cir. 1983).
[58] 534 F. Supp. 725, 730 (C.D. Ill. 1982).
[59] 697 F.2d. 179, 186 (7th Cir. 1983).
[60] *Id.* at 187.
[61] *Id.* at 186.

Only one other federal circuit court of appeals has addressed the procedural due process issue in connection with MCT requirements. In *Debra P. v. Turlington*, a case involving minority rather than handicapped plaintiffs, the Fifth Circuit Court of Appeals concluded that all students have due process rights at stake when a competency test is used as a diploma requirement.[63] Because Florida had created an expectation that successful school attendance would lead to graduation, the appellate court held that timely notice of an MCT requirement was necessary before it could be used as a condition of receiving a high school diploma. The court indicated that students should be advised of graduation standards upon entering high school. Thus, the state's provision of only thirteen months' notice prior to using functional literacy tests as a diploma requirement was found to be unconstitutionally brief.

In *Debra P.* the appeals court also ruled that Florida's MCT requirement implicated substantive due process rights. Recognizing that the state was not obligated to provide public schooling, the court reasoned that because Florida had established an educational system and had mandated attendance, any condition attached to the receipt of a high school diploma must be fundamentally fair. The court concluded that the use of functional literacy tests as a diploma prerequisite was potentially unfair because the tests "may have covered matters not taught in the schools of the state."[64] Accordingly, the court charged the state to substantiate the curricular validity of the functional literacy tests. On remand, Florida education officials have the burden of proving that the tests assess what has been taught in Florida schools. The court declared that fundamental fairness necessitates proof that students are tested on material they have actually been presented: "Just as a teacher in a particular class gives the final exam on what he or she has taught, so should the state give its final exam on what has been taught in its classrooms."[65]

In *Anderson*, which also focused primarily on minority plaintiffs, the Georgia federal district court judge followed the *Debra P.* rationale in ruling that school officials must substantiate the curricular validity of a standardized achievement test used as a diploma prerequisite. The judge recognized the differences between Florida's use of a "hastily concocted examination" and the "reliable and well-established test instrument" used in Tattnall County, Georgia. However, the judge found "no choice," in light of "the strong language in *Debra P.*," but to conclude that the Georgia school district had not fulfilled its substantive due process burden of proving that the test covered only material actually taught.[66]

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[62] *Id.* at 187. Of interest is the fact that the Seventh Circuit Court of Appeals quoted extensively from the trial court's decision in *Ambach* in concluding that handicapped students are entitled to early notice of MCT requirements. And the New York appellate court, endorsing three years' notice as sufficient, cited with approval the lower court's decision in *Brookhart*. One can only speculate regarding how the two appellate decisions might have been affected if they had not been rendered within a two-week span.

[63] 644 F. 2d 397, 404–06 (5th Cir. 1981), *rehearing denied*, 654 F.2d 1079 (5th Cir. 1981). For a discussion of the court's treatment of the racial discrimination claim in this case and in Anderson v. Banks, see Martha McCarthy, "Minimum Competency Testing for Students: Educational and Legal Issues," *Educational Horizons*, 61 (1983), pp 105–107.

[64] *Id.*, 644 F.2d at 404.

[65] *Id.* at 406. At the time this article went to press, oral arguments had just been presented to the federal district court in which the state attempted to establish that the curriculum matches the functional literacy test.

In June 1982, after school authorities were given an opportunity to present evidence that the achievement test matched the instructional program, the federal district judge concluded that the curricular validity standard had been satisfied.[67] Acknowledging that a student performing far below grade level might not be exposed to all of the material covered on the test, the judge nonetheless concluded that the school authorities had met their burden of proof: "To require school officials to produce testimony that every teacher finished every lesson and assigned every problem in the curriculum would impose a paralyzing burden on school authorities and hamper them in constructing an academic program which they believe most effectively meets the needs of their students."[68]

The Georgia federal judge also departed from the Fifth Circuit Appellate Court's reasoning regarding the length of notice needed before use of an examination as a diploma requirement. Recognizing the "judicial system's traditional deference to the educational expertise of school authorities," the judge noted that "no one could seriously contend that academic requirements could never be changed during the twelve years a child typically spends in school."[69] He concluded that the period of notice of more than two years was constitutionally adequate, especially in light of the fact that students could retake the examination and were provided remedial opportunities.

Since the Supreme Court has not yet addressed students' due process rights in connection with MCT mandates, the procedural requirements remain somewhat unclear. While several courts have condoned the use of proficiency tests as a diploma prerequisite if students have been advised two to four years before instituting the requirements, the Seventh Circuit Court of Appeals indicated in *Brookhart* that even four years' notice may not be sufficient to protect handicapped students' due process rights.[70] If other courts conclude that handicapped pupils should be made aware of graduation standards while still in elementary school, the use of proficiency tests as a diploma requirement for the handicapped may be delayed for several years.

The scope of handicapped students' substantive due process rights in connection with MCT mandates also has not been clarified by the courts. According to the Fifth Circuit Court of Appeals, school authorities must substantiate that proficiency tests used as a diploma requirement match not only the school's curricular objectives, but also the knowledge and skills actually taught to students.[71] This curricular validity standard may be somewhat difficult to satisfy in general,[72] but it could present particular problems in connection with handicapped pupils who have not been exposed to the regular instructional program.

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[66] Anderson v. Banks, 520 F. Supp. 472, 509 (S.D. Ga. 1981).

[67] Anderson v. Banks, 540 F. Supp. 761 (S.D. Ga. 1982).

[68] *Id.* at 765–66.

[69] 520 F. Supp. 472, 505–06. The court relied heavily on Mahavongsanan v. Hall, 529 F.2d 448 (5th Cir. 1976), in which the appeals court ruled that a graduate student's due process rights were not impaired by the university's decision to require a comprehensive examination even though the requirement was instituted after the student began her graduate studies. The appeals court concluded that slightly over a year's notice of the requirement was reasonable, particularly in light of the opportunity to retake the examination.

[70] 697 F.2d 179, 187 (7th Cir. 1983).

[71] Debra P. v. Turlington, 644 F.2d 397, 404–06 (5th Cir. 1981). For a discussion of curricular validity in connection with proficiency tests, see Merle McClung, "Competency Testing Programs: Legal and Educational Issues," *Fordham Law Review*, 47 (1979), 682–683.

Handicapped plaintiffs in the future may rely on *Debra P.* in asserting that they cannot be subjected to MCT requirements if their IEPs do not cover material on the tests, but it seems unlikely that the Fifth Circuit Court of Appeals intended such broad application of the curricular validity standard. In *Ambach*, the New York appellate court specifically rejected the petitioners' reliance on *Debra P.*, noting that Florida had previously been engaged in *de jure* racial discrimination which triggered the stringent test validity standard. Regarding New York's basic competency test, the appeals court noted that the material covered would form "part of virtually any acceptable reading or mathematics curriculum," and therefore its content validity "more than adequately resists petitioners' challenge on due process grounds."[73] The federal district court in *Anderson* also found that the standardized achievement test used as a diploma prerequisite satisfied that curricular validity standard even though some students may not have been exposed to all of the material on the test.[74]

The federal district court in *Brookhart*, noting that possibly no test of human beings is "scientifically exact," concluded that the MCT used in Peoria is a reasonable test of the school district's accomplishments in educating its students. Recognizing that test modifications must be made to enable physically handicapped children to demonstrate their knowledge, the court declared that the test need not be altered to avoid contact with a child's mental deficiency: "To do so would simply be to pretend that the deficiency did not exist, and to fail completely to measure the learning."[75] However, the Seventh Circuit Court of Appeals avoided the test validity issue, finding that it could provide the plaintiffs relief on "less intrusive grounds" since notice of the MCT requirement was insufficient.[76] While the appellate court hinted that the validity of proficiency tests used with the handicapped might be difficult to substantiate,[77] it did not rule that the MCT diploma requirement would violate substantive due process rights if applied to handicapped pupils who have not received the requisite instruction.

Although judicial precedent lends support to the contention that all students are entitled to adequate notice of graduation requirements, it seems to stretch the concept of substantive due process to conclude that mentally handicapped students must be exposed to material covered on an MCT if their diplomas are to be conditioned on passage of the test. Fundamental fairness may require longer notice for certain categories of handicapped pupils so that those capable of preparing for the MCT have the opportunity to do so, but there seems to be nothing fundamentally fair about placing a mentally handicapped child in an instructional program that is beyond the child's grasp. If, for example, a mentally retarded pupil's individualized program is in fact appropriate to address that child's needs, it probably will not include much of the material covered on the MCT. However, this situation should not preclude the use of an MCT to certify that recipients of a high school diploma have acquired a minimum set of competencies.

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[72] See Charles Thomas, "The Minimum Competencies of Minimum Competency Testing," *Viewpoints in Teaching and Learning*, 56 (1980), 25-46; and in the same issue, Clinton Chase, "Minimum Competency Testing: Are the Instruments Adequate?" 47-52.

[73] Board of Educ. of Northport-East Northport Union Free School Dist. v. Ambach, 458 N.Y.S.2d 680, 688 (App. Div. 1982).

[74] Anderson v. Banks, 540 F. Supp. 761, 765-66 (S.D. Ga. 1982).

[75] Brookhart v. Illinois State Bd. of Educ., 534 F. Supp. 725, 729 (C.D. Ill. 1982).

[76] 697 F.2d 179, 184 (7th Cir. 1983).

[77] *Id.*

Unresolved Issues

The law is clear that handicapped children cannot be denied the opportunity to take a competency test or to satisfy other standards attached to the receipt of a high school diploma. Litigation to date indicates, however, that the award of a diploma to the handicapped can be conditioned on passage of a proficiency test if appropriate accommodations and procedural protections are provided. Yet, several issues pertaining to the application of MCT mandates to handicapped students have not been resolved. Some of these issues have implications for the use of MCT requirements per se as a prerequisite to receipt of a diploma.

Test Validity

It is generally agreed that federal regulations require accommodations in administering MCTs for physically handicapped children to assure that the students' actual ability is being assessed. Accordingly, modifications in the test instrument (such as braille format for the visually impaired) and testing situation (such as flexible scheduling and alternative response modes) have been incorporated in MCT mandates in some states.[78] The controversial issue is where the line should be drawn in designing accommodations to maintain the validity of the tests.

Problems arise when the handicap is directly related to what is being assessed. The most obvious example is the mentally retarded child who clearly is disadvantaged *because* of the handicap on any test measuring mental ability. It would appear that modifications to offset the mental deficiency would not be necessary or perhaps even allowed. But more troublesome questions arise in connection with various physical handicaps. For example, should the child who cannot write because of a crippling condition be allowed to give verbal responses? And if so, might this child be unfairly advantaged over the nonhandicapped child who must translate thoughts into written form? According to a report recently released by the National Research Council, alternative test forms for the handicapped have not been adequately validated to establish their equivalency to examinations for nonhandicapped students.[79] For example, data are not available regarding how much additional time should be given to the blind student who is taking a test in braille to ensure that the student has a comparable opportunity to display knowledge. As noted previously, both EHA and Section 504 require tests used with the handicapped to be valid measures of the students' ability and not their impaired communication skills. Such assurances may be difficult to provide in connection with some MCT programs.

In addition to validity problems associated with modifications in the test instrument and environment for the handicapped, there are unresolved validity issues in connection with the legal obligations placed on school authorities to substantiate that the test matches the curriculum taught. If the judiciary should adopt the curricular validity standard introduced in *Debra P.* to assess the application of MCT mandates to the handicapped, school officials may find themselves caught between competing requirements. The placement of mentally deficient children in an instructional program consistent with the MCT to assure the test's curricular validity might impair the students' federal entitlement to an appropriate educational program. But substantive due process rights might be compromised if such children are provided specialized instruction and then have their diplomas conditioned on an MCT covering material that has not been presented to them.

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[78] For example, Florida regulations stipulate elaborate modifications which include flexible schedules, adaptable settings, format modifications, allowances for alternative response modes, and the use of auditory aids. Rule 6A 1.943, FAC.

[79] "Fairer Tests for Handicapped People Sought by National Research Council," *The Chronicle of Higher Education*, 26 May 1982, p. 10.

The curricular validity standard is problematic, even assuming that it does not require a match between the test and the IEPs of students who are incapable of mastering the competencies. Given the current limitations in testing technology, coupled with the fact that teaching is more of an art than a science, school officials may find it difficult to substantiate that an MCT is a fair test of what has been taught in the *regular* instructional program.[80] Far more sophisticated instructional monitoring mechanisms may be required to assure that the content covered on MCTs has been adequately presented to pupils. If a single competency examination is used statewide, it appears that all school districts would have to standardize a substantial portion of their curriculum in order to verify the validity of a state-prescribed test. Such centralization of curricular decisions faces strong resistance from advocates of local control in education.

If other courts should endorse the curricular validity standard and conclude that a state cannot use a competency test as a graduation requirement until substantiating that the test measures fairly what has been taught, it seems logical that other tests used to evaluate students should satisfy a similar mandate. Would not semester tests or even daily tests become vulnerable to judicial scrutiny? This approach has the potential to bring all student evaluation procedures before the critical eye of the courts. After all, a semester examination in a course—or the combination of several test scores—could determine whether a given student receives credit for the course and ultimately a diploma. It might be argued that such tests are used as a diploma sanction, just as are MCTs, and thus should be subject to the curricular validity requirement. The Fifth Circuit Court of Appeals may indeed have opened a Pandora's box by prescribing this standard.

Individualized versus Standardized Diploma Criteria

Currently, some states have standardized diploma requirements for the nonhandicapped and individualized criteria for the handicapped. This double standard raises questions about the meaning of a high school education. If a diploma is used to signify mastery of individualized objectives (at least for some students), this credential loses any universal meaning. Employers and institutions of higher education would have to review individuals' high school transcripts to assess their academic preparation. The award of a diploma to students who have not mastered basic skills might build false expectations regarding subsequent employment and educational opportunities.

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[80] See James Guthrie, "An Assessment of Educational Policy Research," *Educational Evaluation and Policy Analysis*, 2 (1980), 48; Thomas C. Thomas and Dorothy McKinney, *Accountability in Education* (Menlo Park, Calif.: Stanford University Research Institute, 1972), pp. 6–18; *see also* fn. 72. In August 1982 a new intelligence test was introduced at the annual convention of the American Psychological Association. This test, the Kaufman Assessment Battery for Children (K–ABC), is touted to be bias free and to represent a major advance in testing technology, with particular implications for minority and exceptional children. See "'Unbiased' Intelligence Test Unveiled, Called Revolutionary," *Education Daily*, 25 Aug. 1982, pp. 1–2.

Assuming that a high school diploma is designed to signify a certain level of academic attainment, then standardized graduation requirements would appear necessary. The length of time spent in school might vary among students and instruction might be individualized, but the criteria for receiving a diploma would remain constant.[illegible] If graduation requirements are waived only for the handicapped, nonhandicapped students might allege an equal protection violation. While the Georgia federal district court judge suggested in *Anderson* that a state is empowered to award regular diplomas to students regardless of their achievement,[illegible] such a practice might be vulnerable to discrimination charges. A state could possibly grant diplomas to *all* pupils without reference to academic standards; however, a practice of conditioning *some* students' diplomas on scholastic criteria would seem difficult to justify, even under the lenient rational basis equal protection test.

The legality of a double standard for the handicapped and nonhandicapped to qualify for a diploma may soon become controversial in Illinois. A recently adopted state regulation stipulates that a handicapped child cannot be denied a diploma if, because of a handicapping condition, the child does not satisfy MCT standards. The federal district court judge in *Brookhart* voiced concern that under this regulation school officials will be required to award diplomas to mentally deficient students while withholding the same benefit from nonhandicapped students who do not demonstrate mastery of prescribed competencies.[illegible] The judge further suggested that without reasonable measures "of the accomplishment of the school system in imparting basic knowledge to all its students, . . . no certification of graduation from an educational program can have any meaning whatsoever, to the student or to others, as the notice of educational attainment it is meant to be."[illegible] The Seventh Circuit Court of Appeals also observed that the new Illinois regulation might preclude using the MCT as a diploma prerequisite for handicapped students who are incapable of mastering the competencies, but it noted that "the question is presently premature for resolution."[illegible] Although the appellate court was not asked to address whether the rights of the nonhandicapped might be compromised under the regulation if they must satisfy graduation requirements that are waived for the handicapped, this issue seems likely to be raised in the future.

Identification of Minimum Competencies

The establishment of graduation standards appears defensible as a legitimate means to give value to a high school diploma, but there are unresolved issues associated with de-

[illegible] Of course, the use of standardized competency requirements raises the issue of the state's obligation toward those found to be incompetent. Do students who repeatedly fail the MCT have a legitimate claim to remediation and perhaps to additional years of public schooling?

[illegible] 520 F. Supp. 472, 511 (S.D. Ga. 1981).

[illegible] 534 F. Supp. 725, 729, n. 5 (C.D. Ill. 1982). The 1981 amendment to the state law stipulates: "No handicapped student may be denied promotion, graduation or a general diploma on the basis of failing a minimal competency test when such failure can be directly related to the student's handicapping condition."

[illegible] *Id.*, 534 F. Supp. at 728.

[illegible] 697 F.2d 179, 182 n.4 (7th Cir. 1983).

termining what these standards should be. Minimum competencies have been prescribed based on the assumption that specific knowledge, skills, and behaviors are needed for students to function successfully as adults. Yet, data are not available to substantiate that the competencies currently required are the only (or most important) ones necessary to ensure success in the various adult roles for which they are purportedly prerequisites. Might a student who fails the MCT and is denied a diploma become successful if success is measured by subsequent earnings?

The identification of the list of required minimum competencies has particular implications for various categories of handicapped pupils. The selection of certain skills, such as the ability to write, might automatically exclude some physically handicapped children from satisfying the MCT requirement. Should the inability to write result in a label of incompetence if the individual can communicate adequately using other means?

States and local school districts may increase their vulnerability to educational malpractice suits if certain competencies used as a diploma requirement cannot be justified. Moreover, there are other sources of potential liability associated with MCT mandates. A student possibly could secure damages by establishing that the prescribed skills have not been adequately taught, that the skills taught have not been mastered (despite passage of the MCT), or that the skills acquired have not resulted in the promised success in adult roles. Although plaintiffs have not yet prevailed in charging school districts with instructional negligence,[88] MCT mandates may provide stronger grounds for such suits.

Conclusion

It seems unlikely that courts will or should exempt handicapped students from diploma requirements, including passage of a proficiency examination. However, it seems quite likely that the judiciary will continue to scrutinize MCT mandates to ensure that handicapped as well as nonhandicapped pupils' substantive and procedural rights are protected. The amount of notice legally required before using an MCT as a diploma sanction, the scope of accommodations required in administering competency tests to handicapped pupils, and the nature of proof necessary to substantiate the validity of proficiency examinations seem destined to generate subsequent litigation.

The legal activity pertaining to MCT mandates may ultimately force states to be more precise in articulating objectives for public schools and in defining the purpose of a high school diploma. State and local educational policymakers may be faced with justifying the selection of certain competencies as diploma criteria and proving that these particular competencies are in fact prerequisites to success in various adult roles. Moreover, school officials may be judicially required to substantiate that examinations and other student assessment strategies are valid measures of what has been taught and what should be learned. Legal controversies over MCT mandates may nurture a change in the traditional judicial deference to educators in academic matters. The coming decade may witness an increase in judicial activism to assure that academic standards and student evaluation practices are indeed fair.

[88] *See* Hunter v. Board of Educ. of Montgomery County, 439 A.2d 582 (Md. App. 1982); Tubell v. Dade County Public Schools, 419 So.2d 388 (Fla. App. 1982); Hoffman v. Board of Educ., 424 N.Y.S.2d 376 (1979); Donohue v. Copiague Union Free Schools, 391 N.E.2d 1352 (N.Y. 1979); Peter W. v. San Francisco Unified School Dist., 131 Cal. Rptr. 854 (Cal. App. 1976).

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Recent Reform Proposals for American Education

Lawrence C. Stedman and Marshall S. Smith

A Nation at Risk: The Imperative for Educational Reform
by the National Commission on Excellence in Education
Washington, D.C.: U.S. Government Printing Office, 1983

Action for Excellence: A Comprehensive Plan To Improve Our Nation's Schools
by the Task Force on Education for Economic Growth
Denver: Education Commission of the States, 1983

Academic Preparation for College: What Students Need To Know and Be Able To Do
by the College Board
New York: College Entrance Examination Board, 1983

Making the Grade
by the Twentieth Century Fund Task Force on Federal Elementary and Secondary Education Policy
New York: Twentieth Century Fund, 1983

During the past few months, several commissions have published reports proposing major reforms for our educational system. Four of these reports, listed above, have received widespread attention. Their publication (with special credit to the National Commission) has spurred the greatest national debate on education since the launching of Sputnik in 1957. In this review, we describe each commission and

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its report, and examine their case for reform and their recommendations. Our focus is on the quality of their analysis and their recommendations rather than on the rhetorical or political importance of the documents. Our analysis is intended to be provocative rather than conclusive.

The Commissions and Their Reports

A Nation At Risk

The National Commission on Excellence was an 18-member panel appointed by Education Secretary Terrel H. Bell in 1981. Its chair was David P. Gardner, president of the University of Utah, and president-designate of the University of California. The panel included Yale University president A. Bartlett Giamatti, former Minnesota governor Albert H. Quie, a retired chairman of the board of Bell Labs, the immediate past president of the San Diego School Board, a Harvard physicist, and the 1981-1982 National Teacher of the Year. The panel was charged with making practical recommendations to foster academic excellence in our nation's schools. To prepare its report, the panel commissioned research papers, met with administrators, teachers and representatives of professional and public organizations, and studied existing analyses of educational problems. Its recommendations focus on upgrading content, raising academic standards, increasing time on academic subjects, and providing greater financial rewards and status for teachers. Specific recommendations include an emphasis on the "new basics," including social studies and computer competency, 7-hour school days and 200- to 220-day school years, and a 3-tiered system for ranking and paying teachers: beginner, experienced, and master.

Action for Excellence

The national Task Force on Education for Economic Growth was established by the Education Commission of the States. The task force, chaired by James Hunt, governor of North Carolina, and co-chaired by Pierre duPont, governor of Delaware, and Frank Cary, chairman of the executive committee of IBM, was composed of governors, legislators, corporate chief executives, educators, and labor leaders. It was primarily concerned with the role education could play in solving the crisis in American economic productivity and growth. Although many of its recommendations are similar to those of the National Commission on Excellence—focusing on the new basics, increased academic time, and teacher quality—two major proposals are quite different. The report calls for governors to take leadership in the reform effort and to appoint state task forces on education for economic growth to promote improvement. It also calls for the creation of partnerships between businesses and schools, including courses taught in factories and offices and team teaching using specialists from industry.

Academic Preparation for College

The College Entrance Examination Board's study was an outgrowth of an earlier report by the Education Equality Project on improving high school students' intellectual skills. The new report represents, therefore, the efforts of 1,400 college and high school teachers and administrators, parents and students, and representatives of professional organizations who have worked together since 1980 on the problem of college preparation (Watkins, 1983, p. 14). The report presents guidelines for each academic subject—English, the arts, mathematics, science, social studies, and foreign language—outlining the skills necessary for college.

The report differs from the *Nation at Risk* and *Action for Excellence* reports in that it stresses academic content over academic time. It is also the only one of the four reports to recommend improving student competence in the arts, giving equal weight to the humanistic aspects of education and to math and science.

Making the Grade

The Twentieth Century Fund, founded in 1919 and endowed by Edward A. Filene, is an "independent research foundation which undertakes policy studies of economic, political, and social institutions and issues" (1983, p. iv). Its Board of Trustees includes Hodding Carter, III, Patricia Roberts Harris, Arthur Schlesinger, Jr., William Ruckelshaus, and Shirley Williams, former British Member of Parliament. Its task force on education was chaired by Robert Wood, the director of Urban Studies at the University of Massachusetts and former superintendent of schools in Boston. Other members of the task force included Carlos Hortas, chairman of romance languages at Hunter College; Diane Ravitch, Columbia University professor, educational historian, and author of *The Revisionists Revised;* Wilson Riles, former superintendent of public instruction for California; and Patricia Graham, dean of the Harvard Graduate School of Education. The report focuses on the role the federal government should play in the current economic and educational crisis. This federal policy focus is unique among the four reports. Nevertheless, many recommendations display the same concern with academic content and teacher quality that is present in the other reports. One major proposal, for example, calls for the creation of a National Master Teacher Program with rewards and grants going to state-level selected master teachers. Other proposals reveal the task force's interest in uniform national approaches, such as the recommendation that federal requirements and funds for children with limited proficiency in English be focused on language immersion and English-as-a-second-language programs rather than bilingual programs. Finally, there is a proposal, not universally endorsed by members of the task force, for the creation of a federally financed public school voucher scheme for educationally disadvantaged students.

The Case for Reform

The four commissions were responding to the current American economic crisis, particularly the decay in our industrial base and the decline in our economic power relative to that of foreign countries. They were also responding to what is considered to be two decades of American educational failure, to what one report describes as a "rising tide of mediocrity that threatens our very future as a Nation and a people" (National Commission on Excellence in Education, 1983, p. 5). Their recommendations are designed to cure our educational failures and to prepare students for a new society—for a future economy based on high technology, emphasizing information processing and computers. By adopting these recommendations, the commissions believe, the United States can recapture its economic vigor and regain its competitive edge in the world economy.

At the outset, it should be recognized that these reports are political documents; the case they make takes the form of a polemic, not a reasoned treatise. Rather than carefully marshalling facts to prove their case, they present a litany of charges without examining the veracity of their evidence or its sources. By presenting their material starkly, and often eloquently, the commissions hoped to jar the public into action, and to a great extent they have been successful. Caveats and detailed analysis of evidence might have lessened the reports' impact.

The argument for reform was spelled out in detail in *A Nation at Risk*, and the case it makes forms the basis of our critique. We focus on three aspects: the quality of the evidence for the poor state of American education, the claim that the U.S. education system is inferior to those of foreign countries, and the assumption that a high-technology (hi-tech) revolution is sweeping the American economic system. After considering these aspects of the argument, we review the four reports' recommendations and discuss their viability.

The Nature of the Evidence on Academic Performance and Standards

The rhetoric of the reports concerning the decline in student performance and the relaxation of educational standards is reminiscent of the 1950s attacks on progressive education (see, e.g., Lynd, 1953; there were also calls for excellence, see, e.g., Gardner, 1961). The argument primarily rests on the ability of the report to evoke a sympathetic reaction of the reader: to nod and say "Yes, we've heard that before, we've retreated from academics and excellence," and to accept the "Back to the basics" shibboleth. The widespread perception of an undisciplined 1960s has guaranteed a national acceptance of the commissions' argument despite the reports' poor documentation.

Academic performance. The National Commission presents 13 representative indicators of "the educational dimensions of the risk." One indicator contrasts achievement in the United States with other nations and will be discussed later; 5 describe contemporary U.S. achievement; and 7 contrast past achievement with present. Viewed critically they provide more convincing evidence of the lack of quality of our indicators than of our educational system.

Two of the five contemporary snapshots cite data about the prevalence of illiteracy in America and are neither current nor without controversy. The first stated that "23 million American adults are functionally illiterate by the simplest tests of everyday reading" (p. 8). This measure comes from a study carried out a decade ago that has been extensively criticized by the National Institute of Education (NIE) (Fisher, 1978). The other found that 13 percent of 17-year-olds were functionally illiterate in 1974 and again in 1975. These data were collected by the National Assessment of Educational Progress (NAEP); many of the same items were also given in 1971. The data indicate that the 1974 and 1975 cohorts of 17-year-olds scored higher than the 1971 cohort. (Fisher, 1978; Gadway & Wilson, 1975). Apart from the problem of defining "literacy" at any given moment in history, and that the definition has changed over time to become more rigorous as society has changed its demands, it is clear from almost every recent report that the problem of illiteracy for young adults is very heavily concentrated in the poor and minority (particularly male) population, a fact that goes unmentioned in the report.

The third snapshot is insufficiently explained. It finds that "over half the population of gifted students do not match their tested ability with comparable achievement in school" (p. 8). This may suggest as much about our skill in assessing "ability" and "achievement" as it does about the quality of the educational system. Given the imperfect reliability of our tests over time, the Commission's statement sounds suspiciously like "over half of the sample scores below the median."

The last two of the contemporary indicators are more persuasive. The first pointed out that 25 percent of Navy recruits required remedial reading in order to understand written safety instructions. The other was recent National Assessment data that showed many of the nation's 17-year-olds cannot carry out reasonably complex intellectual tasks. This latter case has been forcefully made by other commentators (Holmes, 1982).

The case for a serious "decline," though rhetorically compelling, also does not stand up very well. Three of the Commission's seven indicators of decline are drawn from the College Entrance Examination Board (the College Board) data. One cited the drop in SAT scores over the past 20 years, with no mention that the population taking the tests has changed fairly dramatically during the same period (College Entrance Examination Board, 1977). A second found "consistent achievement test declines in recent years in such subjects as physics and English" (p. 9), without also pointing out that "mean grades increased between 1969 and 1979 on all College Board advanced placement tests in science and mathematics as did the number of students who took each test" (Jones, 1981, p. 415). A third College Board indicator found the number and percentage of very high test scores dropping substantially over the past two decades. This seems to us to be a valid indicator and a matter for legitimate concern.

Of the other four indicators of decline, only one deserves serious attention. The Commission cited a "steady decline in science achievement scores of U.S. 17-year-olds as measured by the NAEP in 1969, 1973, and 1977" (p. 9). This decline, however, is small, amounting to a drop of only 4.7 percentage points correct over an 8-year period (NAEP, 1978). Over the past decade, declines in other tested areas of the NAEP, such as math and writing were also small (NAEP, 1979, 1980, 1981), whereas in reading the performance of "American youth improved for young students, while teenagers tended to hold their ground" (Holmes, 1982, p. xi).

Our purpose in being critical of the Commission's indicators is not to deny that test scores of American youth have declined or that they shouldn't be higher. Rather, we wish to point out the poor quality of their treatment of the data and, with the exception of National Assessment, the abominable nature of national data on school performance. Even so, it is conceivable that careful treatment of the existing evidence on academic performance in areas such as the incidence of literacy (which suggests a focus on the poor, the minorities, and urban school children) and the acquisition of higher order skills (which suggests changes in strategies of instruction and sequencing of content) might have led to more carefully honed recommendations than those reached by the Commission.

Academic standards. Here, too, the evidence is weak. The National Commission, for example, argued that a widespread growth of electives had diminished the academic focus and claimed that the secondary school curriculum has been "homogenized, diluted, and diffused" (p. 18) and that the resulting "curricular smorgasbord . . . explains a great deal about where we find ourselves today" (p. 18). This generalization rests primarily on a supplementary study conducted by Adelman (1983), which analyzed changes in high school transcripts of two samples, one covering 1964–1969 and the second, 1975–1981. The problem with the study is that these two samples are not comparable. The early one was of only 27 high schools, with little Southern representation and no schools from cities of population over 1 million. The second was a national sampling of households. There is no longitudinal study of a given set of high schools on which the Commission's claims rest.

Even if the two samples were comparable, the evidence presented in the Adelman report barely justified the claim made. Although the later sample showed a threefold increase in the percentage of students in the general track and substantial increases in such courses as driver's education and marriage training, the total time spent on academics was much less different for the two samples. Taking all high school graduates together, the percentages of all credits received that were generated by academic subjects were 69 percent in the first sample and 62 percent in the second (Adelman, 1983, Appendix F). Although the second sample had lower credits in a number of academic subjects, in many others the differences were small. Chemistry and intermediate algebra credits, for example, differed by 6 percent, Spanish I by 7 percent, and biology by only 3 percent. In the general track, the percentage of students in the second sample taking such academic subjects was higher, not lower. (Geometry rose from 22 percent to 32 percent, intermediate algebra from 18 percent to 19 percent, and chemistry from 10 percent to 19 percent.) These data, therefore, lend only weak support to the claim that academics have been seriously weakened.

Other data drawn from representative samples indicate only a modest overall decline in academic emphasis. Table I presents our preliminary analyses comparing the senior classes of 1972 and 1980 for nationally representative samples. These data do show some reduction in the percentages of "all" students in academic classes over the 8-year period from 46 percent in 1972 to 39 percent in 1980. They

TABLE I

Percentages of High School Seniors (self-reported) Enrolled in Different Tracks in 1972 and 1980

Track	Sample					
	Black		White		All[a]	
	1972	1980	1972	1980	1972	1980
General	37.6	36.4	31.4	36.8	32.6	36.8
Academic	27.8	34.0	49.6	40.0	46.2	38.7
Vocational	34.6	29.6	19.0	23.1	21.2	24.5

[a] Includes other minorities.

Note. 1980—20 percent random sample of "High School and Beyond" seniors (from National Center for Education Statistics, U.S. Dept. of Education).

1972—20 percent random sample of the Class of '72, "National Longitudinal Survey," seniors (from National Center for Education Statistics, U.S. Dept. of Education).

The analyses above were performed by Ki-Seok Kim of the Wisconsin Center for Education Research, University of Wisconsin, Madison.

also show concomitant increases in the percentages of "all" students in the general and vocational tracks. But overall data may be obscuring important interactions, for example, the changes between whites and blacks. In 1972 roughly 28 percent of blacks were enrolled in academic tracks, while almost 50 percent of whites were in the academic tracks. By 1980 the gap had been reduced by over 70 percent. The black percentage enrollment in the academic track had increased to 34 percent, while the white percentage had dropped to 40 percent. Such dramatic differences indicate the need for further study.

Academic content, of course, was not the only example presented of weaker school practices. The various commissions also cited declining amounts of homework required, the relaxing of discipline, and the giving of higher grades for the same work. Though much of their evidence was anecdotal, data do exist on changes in homework requirements *and* on "grade inflation" (Takai, 1983). However, with the exception of homework, there are no hard data on the effects of these changes on achievement, and in the case of homework the results are often contradictory (see, e.g., Ginsburg, Milne, Myers, & Ellman, 1983; Wolf, 1977).

Even if there were changes in some school practices, it is not clear that these were responsible for the decline in performance. A major study of the SAT decline, for example, suggested that the decline had little to do with changing school practices. The College Board, in *On Further Examination* (1977), found that between two-thirds and three-fourths of the decline from 1964–1973 could be attributed to the changing social composition of the test takers. A smaller percentage of the decline from 1973 could be attributed to population changes. The remaining portion of the decline was not soley attributable to the schools but also to changing social conditions such as student unrest, increase in television watching, and so on. A supplementary study by Echternacht (1977) compared high schools whose SAT scores had remained stable or risen slightly between 1965 and 1976 to a group whose scores had declined more than the national average. He found that differences in the number of academic courses taken in the "effective" and "ineffective" schools were tiny. English curriculums were similar; pass-fail grading and nontraditional offerings had expanded to the same extent. Rather than abandoning academics, many high schools with decreasing scores had increased homework and expanded basic skill instruction. Echternacht (1977) concluded, "Changes in the curriculum explain little of the SAT decline for this study's sample of schools" (p. 5).

Similarly, Peterson (1983), in an excellent review of the status of American education published as part of the Twentieth Century Fund report, concluded, "Nothing in these data permits the conclusion that educational institutions have deteriorated badly" (p. 59). The Fund's Task Force, however, argued as if they had. This is one of a number of examples where the commissions ignored the findings of their supplementary reports.[1]

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[1] The examples include overstating the decline, asserting across the board foreign educational superiority, ignoring cultural factors in the Japanese educational performance, and placing an improper emphasis on time as an explanatory factor in higher achievement.

International Comparisons

The commissions argue that, because U.S. schools fail to teach as well as those in other countries, we need to copy them to improve our test scores and technical preparation. The main features they recommended copying are time spent on academics, in particular longer school days and school years, and academic content, specifically curricula with a strong emphasis on math and science. There are major difficulties with this line of reasoning. First is the claim that U.S. students uniformly perform worse than those in other countries. The National Commission relies on the International Assessment of Educational Achievement (IEA), which has been the only major systematic international study. The data available to the Commission were gathered over a decade ago during the years 1964 to 1971. The Commission used country averages reported by the IEA to make their comparison. This approach has been strongly criticized (Husén, 1983). The averages were generated from noncomparable student bodies—in most other countries a small select group of students attending academic schools was tested, while in the United States both college-and noncollege-bound students attending comprehensive high schools were tested. The selectivity of the foreign systems is reflected, in part, by the percentages of students remaining in school. In West Germany, for example, only 9 percent of the age cohort reached their terminal year of high school in the early 1970s, whereas in the United States approximately 75 percent did (Comber & Keeves, 1973, p. 159). It should not be surprising that a more academically select group would perform better than the average U.S. student. As one observer remarked on the science scores, "The scores at age 18 diverged widely by country and are associated with the percentages of students still in school at that age" (Walberg, 1983, p. 7). There has, therefore, been no proper international comparison of the academic performance of the average high schooler.[8]

To make international comparisons using the IEA data, researchers often study the performance of the top students in each country. This still does not tell us how well the various countries prepare the average student but does indicate how well each country prepares a secondary school elite. After making such a comparison, Husén (1983) concluded,

> the international survey of both mathematics and science demonstrated that the top 5 percent to 10 percent at the end of secondary education (i.e., the elite) tended to perform at nearly the same level in both comprehensive and selective systems of secondary education. Thus the elite among U.S. high school seniors did not differ considerably in their performance from their age-mates in France, England, or Germany. (p. 456)[9]

Indeed, if we again look at the most recent IEA results (1970–1971) we see that the "top" 9 percent of U.S. students in their terminal year of high school do better than those in foreign countries at the same level. The data in Table II indicate that, although the U.S. mean for reading comprehension exceeded only 3 of the 14 assessed countries, the top 9 percent of U.S. students exceeded the top 9 percent of *each* of the other countries. These data are strikingly different from those highlighted by the various commissions—though, as with the commissions' data, they are over 10 years old.

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[8] The 1970–1971 IEA testing also compared 10- and 14-year-olds across a variety of countries, age groups at which nearly 100 percent are in school. The U.S. students fared reasonably well on the science, reading comprehension, literature, and civic education tests. For tests of proficiency in French, U.S. students did poorly compared to students in other nations. See Table A for selected comparisons. On the mathematics test given in 1964, U.S. 13-year-olds did quite poorly.

[9] These data, however, were not completely clear-cut. (See chart on achievement presented in Husén, 1983). The top 4 percent of U.S. math students ranked 9th among 12 advanced nations, and achieved well below the top two nations, Japan and Sweden. In science, the differences between the elite performers in each country were smaller, and the U.S., ranking 9th of 14, was closer to the highest ranking countries.

TABLE A

Number of Countries Above and Below the United States Mean in Each Subject at Two Population Levels

Subject	Population I[a] (full-time students ages 10.0–10.11)		Population II (full-time students ages 14.0–14.11)	
	Above U.S. mean	Below U.S. mean	Above U.S. mean	Below U.S. mean
Science	4	11	7	10
Reading comprehension	8	5	2	12
Literature			2	7
Civics			2	6
French Reading comprehension			5	0

Note. From Wolf (1977, p. 54).

[a] Testing in Population I was limited to science and reading comprehension.

These elite comparisons still may be misleading, however, because IEA researchers did not disaggregate data by the type or number of courses taken. In science, for example, we do not know how U.S. students who took 4 years of science did compared to, say, German students who completed a similar sequence.

Perhaps more devastating to such comparisons is that they involve only secondary school students. This ignores the fact that the U.S. educational system is organized differently from those in foreign countries. We have striven for universal postsecondary education, relying on our technical schools, colleges, and universities rather than our high schools to provide technical training and professional specialization. With a marked edge over foreign countries in college and university enrollment, having proportionately, for example, twice as many postsecondary students as Japan (*A Nation at Risk*, p. 34), the effectiveness of our educational system should be evaluated in terms of college performance as well as high school performance. This is particularly true in light of recent reports describing the poor quality of Japanese higher education, with its high absenteeism rates for both professors and students, with rampant grade inflation, and with lax standards (Fiske, 1983a, 1983b, 1983c, 1983d; Zeugner, 1983). No evidence, however, was presented in the Commissions' reports about the performance of our college students relative to those in foreign countries, nor, given the concern with high technology, that our university math and science graduates are less well prepared.

We do not know, therefore, how U.S. students in the late 1960s, and early 1970s actually compared to students in other countries. Nor do we know their comparative performance since then. (This may soon be corrected in math as the results of a second recently implemented IEA study become known.)

The commissions also presumed that academic emphasis, particularly increased time, was the crucial factor in the supposedly better performance of students in these foreign countries. A number of findings from IEA studies bear on this supposition. Teachers in different countries, for example, were asked whether their students had been exposed to course material that covered the topics assessed by the various

TABLE II

Number of Countries Above and Below the U.S. Mean for the Entire Population of Sampled Terminal Year High School Students and for an Estimated Top 9 Percent of Age Group in the Terminal Year

Population	Science		Reading comprehension		Literature		Civic education	
	Above	Below	Above	Below	Above	Below	Above	Below
All tested terminal year students	13	4	11	3	4	3	3	2
Estimated top 9% of terminal year group students	6	11	0	14	0	9	1	6

Note. Numbers differ for each subject. Taken from Wolf (1977, p. 54).

tests. Of course, the coverage of the information in courses affected the country's average test scores. To the extent that increasing course requirements increases the coverage of information that is measured by the test, we can expect test scores to rise.

This approach to increasing time, however, must be distinguished from increasing the time during a school year that is given to a subject. The IEA study of mathematics, for example, found that variations in the amount of instructional time in mathematics and the amount of time on mathematics homework had only small effects on the achievement levels of different countries (Husén, 1967, pp. 182–189).

Length of the school day and year also do not explain variations in countries' achievement. Many of the Western European nations and Japan have longer school days and school years than the United States, but nevertheless had markedly divergent performance levels. Factors other than time must be considered salient. Cultural differences, in particular, can influence school performance and make copying school practices difficult. Japan is a prime example. By focusing on time, the commissions overlooked the more dramatic differences between the Japanese and the U.S. educational systems. The Japanese have extensive school solidarity, built upon student responsibility for cleaning buildings and serving meals, and upon weekly school assemblies punctuated by inspirational messages and songs. The cultural context for education is different. Students work for the honor of their class, school, and family and seek to do well on the rigorous high school and university entrance examinations. Authority relations are different, reflecting cultural factors such as the respect accorded elders. Teachers' desks are on raised platforms, desks are fixed in rows, students rise to greet the teacher, and students give a thank-you bow at the end of lessons. The pedagogy is quite different. There is extensive tutoring of younger by older children, heavy dictation and memorization, and a widespread network of academic centers providing in-service training (see Fiske, 1983a, 1983b, 1983c, 1983d; Hurn & Burn, 1982).

Finally, the commissions' call for copying other systems rests on a mismatch of school practices and achievement data. Given that the student assessments were carried out over a decade ago, a cross-national comparison of *contemporary* school practices is inappropriate. The commissions should have studied what the Japanese and West European school systems were doing then compared to what we had been doing then. What they were doing, more than now, was the early sorting of students by examinations into separate academic and vocational high schools (Hurn & Burn, 1982, pp. 12–13). Such practices would be anathema to most American educators and local school officials. What we had been doing, given that a high school senior in 1964 (the year of the mathematics test) would have begun public schooling in 1952, was traditional schooling, presumably with all the homework, grades, and discipline the commissions are now calling for.

A Hi-Tech Future?

Their third contention is that educational reforms, particularly those centered on math, science, and computers, are essential to restoring the American economic position. Developing computer competency and increasing mathematical and scientific literacy for the general population is a good idea, but we are skeptical that it will lead to our economic recovery. There is little evidence that the American economy is undergoing a *wholesale* transformation to a high-technology society. Although the use of high technology will certainly increase, we expect that most of the economy will look the same in 1995 as it does now. Bureau of Labor Statistics projections, for example, show that most new jobs created during the next decades will *not* be in engineering or the computer fields, but will be concentrated in clerical and retail positions (Bureau of Labor Statistics; 1982; Levin & Rumberger, 1983).[*] Nor does the increase in the use of computers in the work place necessarily demand a more highly trained work force (Carnevale & Goldstein, 1983, p. 13; Levin & Rumberger, 1983). The introduction of computers often results in a simplification of job skills and an increase in job routinization. Many of the jobs generated around computers, for example, often require little skill other than typing. Data entry positions are a prime example.

On the other side of this argument are those who challenge the conclusion reached by the Bureau of Labor Statistics (see, e.g., Tucker, 1983). These analysts see the changes in office technology requiring personnel with greater, not less, intellectual ability. The point, simply put, is that we are as uncertain about future occupational demands as we have always been. This is a good reason for training people to think and to be adaptable. But it does not necessarily justify increased training in math and science.

Finally, we are certain that educational reform is not critical for our *short-term* economic recovery because there is no evidence that our current economic malaise is due to an educational failure. There is, for example, no clear evidence of a shortage of qualified engineers or computer scientists (Walberg, 1983, p. 2). We believe the United States is experiencing high unemployment and low productivity not because of a lack of a technically skilled work force, but because of a worldwide recession, a failure to modernize our industrial plants, and a mismanaged federal budget.

These criticisms do not mean that there is not an educational crisis or that school reforms are unnecessary, or that an improved educational system will not improve our nation's human capital. Certainly we cannot afford to be complacent at a time when half of our high school graduates take no math or science after 10th grade, nearly 40 percent of 17-year-olds cannot draw inferences from written material, and only one-third can solve a mathematics problem requiring several steps (National Commission, 1983, p. 9; Task Force on Education, 1983, p. 23). But our criticisms suggest that in seeking solutions we need to be less concerned with the test score decline and trying to reestablish school practices that existed before the decline, that we should spend less time looking for foreign countries as models, and that we may not need to be as concerned about shaping our reforms to a particular vision of a hi-tech future. Our schools, historically, have failed to educate well a majority of our youth, whether this is measured by college graduation, the capacity to write a cogent essay, mastery of advanced mathematical and scientific concepts, training in literature and foreign languages, or the acquisition of higher-order reasoning and problem-solving skills. This in itself should be sufficient motivation for change. It also suggests that marginal correction may not be sufficient—at the least we should *consider* fundamental institutional changes.

The Recommendations

An important contribution of the commissions is that they have not resorted to elitist solutions. They have not, as they very well might have, proposed extensive adoption of gifted and talented programs, the resurrection of systematic tracking by early test scores, or the introduction of specialized math and science programs for the academic high achievers. Instead they have proposed a redefinition of the basic skills, consisting of an expansion and upgrading of the fundamental abilities schools should impart, and at least three of the four commissions argued that the goal of the reforms is not to train an academic elite but to raise the performance of the average student. The National Commission on Excellence, for example, called for a "high level of shared education" (p. 7), and commented, "We do not believe that a public commitment to excellence and educational reform must be made at the expense of a strong public commitment to the equitable treatment of our diverse population" (p. 13). The Task Force on Education for Economic Growth stated, "We must improve the quality of instruction for all students—not just for an elite, but for all" (p. 18); and the Twentieth Century Fund task force proposed, "the skills that were once possessed by only a few must now be held by the many" (p. 4). The College Board's focus was confined to the preparation of students who plan to attend college, but their project has emphasized expanding opportunities for minorities. We strongly agree with the commissions that this twin focus on higher order skills and general improvement is necessary if we hope to remedy the historical failure of schools to teach the majority.

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[*] BLS projections typically have a high degree of uncertainty. See, for example, Berlin (1983, pp. 25–30). In raising the concern about the limited number of jobs that will require hi-tech skills, we are not denying that the supply of well-trained personnel can affect the location of capital and investment.

Yet, even though the rhetoric is egalitarian, the analysis and the recommendations failed to address the needs of the poor, the minorities, and inner city youth. Strategies to encourage dropouts to remain in school, for example, were not considered by three of the commissions, and were treated superficially by the fourth. The commissions also failed to deal with the problem of enticing good teachers to work in the inner cities and overlooked the desperate lack of employment for many inner city youth. The Twentieth Century Fund task force did propose extending compensatory education programs for poor, low-scoring, and handicapped students, but their attention was slight. The agenda of the nation is shifting away from equal opportunity. We are concerned that there will be trade-offs made between the efforts proposed by the commissions and traditional efforts made on behalf of the poor and educationally disadvantaged. As we review the commission's recommendations, it will be useful to keep this in mind.

The recommendations can be grouped into four categories: leadership, time, content, and teachers (see Table III). In subsequent sections, we briefly describe the recommendations of each commission.

There are two major omissions in the recommendations. The first is that while the commissions were extensively concerned with content and time, that is, the questions "What is taught?" and "For how long?," they ignored the problem of pedagogy, namely the question "How is it taught?" The second is that the commissions failed to consider the implications of the recommendations, particularly the difficulties attending their implementation and the ramifications of adopting them. We can understand why these aspects were omitted; the commissions felt the reports needed to be short and simple to reach a wide public. Details on implementation might have distracted attention from the major message—that the educational system had reached a crisis point—and could have drowned out the reform suggestions. Such omissions also provide local school systems and states with the flexibility to make their own decisions in light of their particular circumstances.

Nevertheless, the failure to include even the briefest analysis of what the policy recommendations would entail weakens their argument. Practitioners, in particular, will consider many suggestions unrealistic. For example, the National Commission on Excellence recommends a 200- to 220-day school year. At first glance lengthening the school year seems a reasonable suggestion—many foreign nations have school years of this length—and the increased time on academics should raise our students' academic achievement. But lengthening the school year, particularly by almost a quarter, has such practical difficulties that the recommendation seems unworkable. First, substantial new curriculum material would have to be developed. Second, it is certainly possible that not all school systems would lengthen their school years to the same extent. What would then happen in our highly mobile society as students moved from one district to another? Third, are teachers to be paid more? Where will the

TABLE III

Commissions' Recommendations

A Nation at Risk National Commission on Excellence	*Action for Excellence* Task Force on Education for Economic Growth	*Academic Preparation* The College Board	*Making The Grade* Twentieth Century Fund
	Leadership		
State and local government should take primary responsibility for reforms Role of federal government: —identify national interest in education —provide research, resources, support for special groups	Governors should develop —state plans —state task forces Business-school partnerships should be formed —team teaching —instruction in offices and factories Principals as instructional leaders	Colleges and secondary schools should take lead in improvements	Federal government should —emphasize the need for better schools —promote literacy in English as the number one goal Continue federal role for poor and handicapped Impact aid shifted from military to immigrants Federal vouchers for educationally disadvantaged
	Time		
	more time		
7-hour school days 200- 220-day years Tighten attendance policies More homework	Longer school days Improved attendance policies (revitalize curriculum, flexible scheduling) More homework		
	more efficient use of time		
Order and discipline Tougher grading Periodic testing Train students in work and study skills Placement and grouping by performance, not age	Order and discipline Tougher grading Periodic testing	Study skills	

	Content		
	(Curriculum)		
Increase high school graduation requirements to (at a minimum): *"New Basics"* (suggested required years) English (4), math (3), science (3), social studies (3), computer (1/2), foreign language (4-6) (2 in high school). The report also listed key competencies in the subjects.	*New Basics* (competencies) Reading, writing, speaking, listening, reasoning, economics	*Academic Subject* Competencies in English, math, science, social studies, computers, foreign language, the arts	*Stress on* English literacy (and bilingual programs), math-science (loans for teachers, grants for students), foreign language (government should help train language teachers)
Implement a national system of standardized tests of achievement for certification and identification of needs	Basic employment	*General Academic Competencies* Reading, writing, speaking, listening, reasoning, mathematics, study skills	
Work and study skills	College entrance requirements increased	College preparation should be strengthened	
College entrance requirements increased	Gifted students' programs		
	Teachers		
Three-tiered system: beginner, experienced, master	Enrich career path, increase responsibility		National master teacher program
Salaries tied to effectiveness	Salaries tied to effectiveness (principals, also)		
Grants and loans for outstanding students in subject matter shortage areas	Financial incentives for shortage areas		
Higher requirements for teacher preparation	Renew teacher preparation curriculum; adopt rigorous standards		
	Flexible certification		
	In-service training		
Textbook improvements: national effort by schools and teachers to improve books and materials; publishers should prove educational effectiveness; states and local agencies should evaluate books and require data			

funds come from? What will the position of teachers' unions be on extending the school year 40 days? Fourth, what will the impact on students be? A longer school year could increase alienation and decrease motivation and, consequently, actually hamper performance. Many such implementation problems can be raised about each recommendation. The commissions also failed to take into account the decentralized nature of the American governmental system. The "top-down" flavor of their recommendations appears more in line with Western European systems, in which the federal government controls education. In such centralized systems the problems of articulation, cost, and side effects are part of a national planning process for major changes in the system. Here, those making recommendations, and in the case of state and federal governments, those making policy, are neither responsible for implementation nor can they easily be held responsible for failure.

Leadership

The commissions differ in what they consider the proper source of leadership for the reforms. The National Commission on Excellence believes that the federal government has the primary responsibility for identifying the national interest in education (as does the Twentieth Century Fund Task Force), including providing some resources, research, and support for special groups (handicapped, minorities, etc.), but that it is the states and local school systems that have the primary responsibility for implementation. In this, they are not as specific as the Task Force on Education for Economic Growth, which also emphasizes state and local leadership, but which directs governors to take the leadership role, creating state plans and statewide task forces that include business leaders to promote reforms. Local efforts would be guided by business-school partnerships and principals acting as instructional leaders within the schools. The College Board recommends that colleges and secondary schools carry out their proposals for strengthening high school curriculums and college entrance requirements.

How these various sources of leadership are supposed to coordinate efforts is unspecified; there could be a marriage of purpose or a clash of responsibility. What is ignored is the growing conviction among effective schools researchers that leadership must come from school-site management (Finn, 1983; Levin, 1983; Purkey & Smith, 1983). The staff of schools must be given the responsibility to construct their own reform efforts, to develop their own plans, to change their own programs, albeit within a framework established by local, state, and federal government. In these reports, however, the leadership comes only from the top. Even the important involvement of parents and community groups goes unmentioned, though the National Commission does have appendices directed at students and parents urging greater attention to academic endeavors.

Finally, there is little recognition of the political ramifications of the leadership sources. This is particularly true of the Task Force on Education for Economic Growth. How closely should business work with the schools? The issue is not only one of vocational education, of keeping dropouts in school longer, or of making the curriculum relevant to the work place, but also one of the influence that private interests should have over a public institution. Through team teaching by industry specialists and public school teachers, and classes taught in the offices and factories (and a host of other cooperative efforts), business will receive major benefits from the *public* training of future employees and can influence the nature and direction of the curriculum. *Action for Excellence*, for example, calls for the transmission of two economic competencies: "the ability to understand personal economics and its relationship to skills required for employment and promotability, the ability to understand our basic economic system (e.g., profits, revenues, basic law of supply and demand, etc.)" (p. 50). Can one doubt that with the involvement of the business community in school, understanding "promotability" and "our basic economic system" will mean an emphasis on corporate values rather than social responsibility? The danger of such an arrangement is suggested in the historic battles against vocational tracking and industrial education (Bowles & Gintis, 1976; Cremin, 1961). All of us recognize that education is more than the production of human capital, but this recognition is obscured when the commissions focus on training students for a hi-tech future or call for reform to be guided by task forces promoting economic growth.

Time

The recommendations for time come in two forms: those that call for increases in the amount of academic time and those that call for more efficient use of time. As can be seen from Table III, time was not a focus of the College Board or the Twentieth Century fund reports. The other two reports contained similar recommendations. Both called for longer school days, improved attendance policies to reduce absenteeism, tougher grading, increased homework, more order and strict, fair discipline, and frequent testing of students. There were some differences. The Task Force on Economic Growth called for introducing critical academic subjects, such as science, earlier in students' schooling. The National Commission on Excellence called for 200- to 220-day school years, whereas the Task Force did not call for lengthening the school year. The National Commission also called for placement and grouping by academic performance, not by age.

In one recommendation, one of the commissions did move beyond simply stating the need for an effective policy and described what might be entailed. On the issue of attendance policies, the Task Force on Economic Growth recognized that the problems of absenteeism and dropouts are linked to the curriculum and the students' alienation. They called for revitalizing the curriculum to retain such students and for helping them set standards for themselves. Yet even here their call raises more questions. What is meant by revitalizing the curriculum? Does this differ from their main recommendation to make the general program more academically demanding and the environment more disciplined, changes which could increase dropout rates?

Finally, there are the recommendations for longer school days and longer school years. We are impressed, as many are, that the average Japanese high school graduate will have spent the equivalent of 4 more years in school than his American counterpart. Although we would agree that increasing academic time should somewhat raise achievement, we would argue that time is not *the* crucial element in higher achievement. More important seems to be the coverage of content. (See, e.g, the discussion of the "opportunity to learn" variable in the IEA studies, Wolf, 1977.) This factor and the various cultural and pedagogical elements discussed previously are more likely the major determinants of high Japanese achievement.

In addition, the most recent analyses of the "time" prescription recognize that quantity is a relatively minor variable in the production of achievement compared to quality, that is, how that time is used. Karweit (1982), for example, in a background paper prepared for the National Commission, concluded that

> present studies of time and learning, contrary to widely publicized statements, have not produced overwhelming evidence connecting time-on-task to learning . . . it is what is done in time and how appropriate it is that affects the learning that takes place. (pp. 51–52)

Thus, rather than simply calling for increased time, researchers are now focused on coverage of content, classroom organization, and teaching techniques that maximize the use of the given time and produce higher achievement.

Content

All four reports propose strengthening the curriculum and increasing the requirements. As can be seen in Table III, they all propose improvements in math and science and stress English literacy. Three emphasize work skills, two mention study skills (the commissions apparently believe as we do that the need to teach study skills has been overlooked by schools or has been poorly done), three call for increasing graduation requirements (two include increasing college entrance requirements), three stress computer competency, and three stress foreign language. The unique recommendations include the National Commission's proposal that textbook publishers demonstrate their books' effectiveness, the Task Force on Economic Growth's proposal to expand gifted programs, and the College Board's emphasis on the arts. The last is one of the most unusual recommendations in the four reports. At a time when the technological emphasis is paramount, only the Board has issued a strong statement of the need for strengthening the humanistic aspects of the curriculum.

Our major concern with how much the recommendations will strengthen the curriculum centers on the "new" basic skills. With the exception of the emphasis on computers (and the Board's arts proposal), the descriptions of the "strengthened" curriculum read like current curriculum goals. The National Commission on Excellence, for example, proposed the following for three important subjects:

> math: understand geometric and algebraic concepts, understand elementary probability and statistics, apply mathematics in everyday situations, and estimate, approximate, measure, and test the accuracy of calculations. . . .
>
> science: the concepts, laws, and process of the physical and biological sciences; the methods of scientific inquiry and reasoning; the application of scientific knowledge to everyday life; and the social and environmental implications of scientific and technological development. . . .
>
> social studies: enable students to fix their places and possibilities within the larger social and cultural structure, understand the broad sweep of both ancient and contemporary ideas that have shaped our world; understand the fundamentals of how our economic systems work and how our political system functions; grasp the difference between free and repressive societies. (pp. 25–26)

Not to mention the obvious problems with agreeing on what some of these mean (consider the last—"grasping the difference between free and repressive societies" in relationship to the debate about U.N. ambassador Jeane Kirkpatrick's distinction between totalitarian and authoritarian regimes), few high school math, science, or social studies teachers would find anything novel in these descriptions. The Task Force on Economic Growth and the College Board did not propose specific numbers of years for each subject, but rather listed competencies that should be acquired in a variety of areas, including speaking and listening, writing, reading, math, and science. Many of these are also the current goals of contemporary secondary schooling. Many high school English curricula, for example, already have as their goals the following writing competencies proposed by the Task Force:

> the ability to organize, select and relate ideas and to outline and develop them into coherent paragraphs.
>
> the ability to write Standard English sentences . . .
>
> the ability to improve one's own writing by restructuring, correcting errors and rewriting
>
> the ability to gather information from primary and secondary sources, and to write a report using this research; . . . and to cite sources properly (p. 48)

One way of thinking about this issue is not to question whether these are appropriate goals, but to ask how we can ensure that classes are organized so students acquire these skills. Beyond suggesting more homework and more frequent testing, the reports are silent on this issue. Given, however, our historical failure to transmit these skills to many of our students, restating the goals and calling for increased academic time without changing the teaching method and instructional climate contributes little. In this way, these reports have much in common with simplistic calls for a "return to basics." Certainly, we might all agree, as the College Board stated, that foreign language competency should involve the "ability to ask and answer questions and maintain a simple conversation" and "to pronounce the language well enough to be intelligible to native speakers," and, as the National Commission recommends, that 4 to 6 years of language study are needed, including at least 2 in high school. But given the atrocious performance of our schools in producing language fluency, these recommendations are hardly enough. We are not sure, in fact, that increasing the years spent would be beneficial without a major reorganization of the way foreign languages are taught. It could well be detrimental. It might be better to spend the money on sending students to the respective foreign country for the summer or for a semester.

Teachers

Silent on pedagogy, the reports suggest only one way to improve the quality of teaching, and that is to improve the quality of teachers. The critique of teacher quality centers on five factors: their low test scores relative to majors in other professional areas; teacher preparation programs that concentrate on methods at the expense of subject matter; their low salaries relative to other occupations; shortages in critical areas such as math and science; and the hiring of unqualified teachers, particularly in these critical areas. Each of these factors, however, has another side which wasn't mentioned in the reports.

1. Teachers historically have had low test scores relative to other majors, which suggests that the test score decline (e.g., student SATs, etc.) cannot be attributed to the teachers' low test scores (Twentieth Century Fund, 1983, p. 27). In addition, studies have shown only a tiny relationship between teachers' standardized test scores and student achievement (Jencks et al., 1973, p. 96, and footnote 111, p. 127).

2. In most teacher education institutions, students preparing to teach at the secondary level must major in their academic subject in *addition* to taking the required methods courses (Clark & Marker, 1983, pp. 55–56); sometimes they are required to take even more courses in their subject areas. For example, in mathematics a history of mathematics course or courses in additional divisions within mathematics might be required. At the University of Wisconsin-Madison, for instance, future secondary school teachers must meet a state requirement of 34 credits in their major subject, whereas liberal arts majors typically need only 30 credits.

3. Studies have *not* found that higher teacher salaries are associated with higher student achievement (see, e.g., Jencks et al., 1973, p. 149). The implication that teachers are not working hard now or are ineffective because of low pay, or that they would behave differently if they were paid more, has not been substantiated. Moreover, the argument that higher salaries are required to attract or retain teachers in critical areas, such as math, must be considered in light of recent data that show only 5 percent of experienced math teachers leave the profession yearly, and some for retirement (Pelavin, Reisner, & Hendrickson, 1983, p. 9).

In our view, teacher effectiveness should be related to a larger vision of working conditions—competitive salary is a part of this, but social status and work place responsibility are others.

4. In spite of the publicity attending the math and science teacher shortage, some school systems are laying off math teachers, not hiring them (National Center for Education Statistics, 1982, p. 101). This presumably is due, in large part, to declining enrollments and severe budget crunches. In addition, the supply and demand forces of the marketplace should, in

the long term, greatly increase the supply of qualified personnel. For example, students at the University of Wisconsin-Madison, presumably spurred by knowledge of math teacher shortages, are already enrolling in math education at increasing rates.

5. The hiring of uncredentialed or partially credentialed teachers must be distinguished from the hiring of unqualified teachers. The reports did not document that the students of undercredentialed teachers performed worse than those of credentialed teachers. Indeed, there could be more incentive for an untenured, undercredentialed teacher to perform well than for a tenured, fully credentialed teacher. In addition, school systems require undercredentialed teachers to take courses to become credentialed. Taking an evening class in the subject or its methodology while teaching the subject can sometimes provide a direct avenue for applying what is being learned and for understanding the role of the student struggling to comprehend new concepts. Both can improve the teaching.

In spite of these weaknesses in their critique of teacher quality, the commissions have proposed one major change that we feel could lead to improved student performance. The commissions have called for relating status and salary to teacher effectiveness. Over the past few months this has led to considerable discussion of the strengths and weaknesses of various merit pay and master teacher approaches. To a considerable degree this debate has been fruitful, leading to a sense that the "merit pay" approach may not be a particularly effective way of improving instruction or retaining good teachers. The "master teacher" strategy, however, has withstood some initial scrutiny and plans are being proposed throughout the nation. The National Commission on Excellence called for a three-tiered system of beginning, experienced, and master teachers, whereas the Task Force on Economic Growth was less specific, calling for enriched career paths with increasing responsibility. The Twentieth Century Fund group proposed a National Master Teacher program. The difficulty, once again, is that the recommendation raises many questions. Who will judge the effectiveness of a teacher? On what criteria? What role will teacher unions have in these decisions? The reports do not discuss these issues.

As can be seen from Table III, the National Commission on Excellence and the Task Force on Economic Growth made virtually identical recommendations in the area of teacher quality. The Task Force did recommend flexible certification procedures to allow specialists and industry workers to teach, even if they might not have all the required courses, and called for extensive in-service training for current teachers and principals. The College Board was silent on the issue of teacher quality.

Conclusion

The commissions used weak arguments and poor data to make their case. Neither the decline in test scores, the international comparisons, nor the growth of hi-tech employment provided a clear rationale for reform. By ignoring their background reports and carelessly handling data, their reports further lost credibility. In particular, the commissions made simplistic recommendations and failed to consider their ramifications. They proposed increasing time without altering pedagogy, instituting merit schemes without describing procedures, and adopting the "new basics" without changing old definitions. They ignored numerous problems—teenage unemployment, teacher burnout, and high dropout rates—that must be solved before American education can be considered sound. They did not address the special needs of the poor and minorities. A blind acceptance of these recommendations could lead to little improvement. Worse, a rapid adoption in the hopes of a speedy improvement could lead to a disenchantment with reform. There is today a crucial dilemma facing education policy. On the one hand, there appears to be a legitimate desire to impose new and more rigorous standards on our nation's schools. On the other hand, recent studies of school effectiveness indicate the need to rest considerable responsibility for a school's instructional program on the shoulders of the staff of the school. Over and over we find that without the commitment of the school staff, topdown mandates will fail. Local school systems and state governments, therefore, should examine these reports carefully before adopting any of their recommendations.

In spite of these criticisms, the commissions have made a number of important recommendations. Their calls for increased academic requirements, curriculum reform, computer competency, and career ladders for teachers could improve the quality of education. The commissions also have been successful in making the educational crisis a public concern. The current focus on education increases the likelihood that successful reforms can be made. The ongoing debate over master teacher plans in many states and local districts is an example. Educators should follow these efforts closely. Their success or failure will be the ultimate test of the worth of the four commissions' reports.

A final note: Part of the fault with the poor handling of data lies with the poor quality of data that are currently available. We recommend two major improvements that could, at a relatively small expense, remedy the present deficiencies: (a) upgrade the quality of national educational data, and (b) expand federal involvement in and funding of U.S. participation in IEA studies. In particular, we suggest that the NAEP become more regular, more frequent, and include extensive information on time and content variables such as the number of homework hours and the number and type of courses students are enrolled in. This would produce a longitudinal data base that could be used to check assertions about changing educational practices and to test hypotheses about the causes of achievement. Participation in IEA studies should be done as part of a greater research effort in comparative education. It would shed light on American educational practice and suggest possible improvements originating elsewhere.

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III. ACHIEVEMENT AND CURRICULA PROBLEMS

Reading, Science and Mathematics Trends: A Closer Look

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[This report is complete. There are no pages I-IV, VI, VIII, X, XII, 14, 18.]

by Barbara J. Holmes

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Foreword

When the U.S. Office of Education was chartered in 1867, one charge to its commissioners was to determine the nation's progress in education. The National Assessment of Educational Progress (NAEP) was initiated a century later to address, in a systematic way, that charge.

Since 1969, the National Assessment has gathered information about levels of educational achievement across the country and reported its findings to the nation. It has surveyed the attainments of 9-year-olds, 13-year-olds, 17-year-olds and adults in art, career and occupational development, citizenship, literature, mathematics, music, reading, science, social studies and writing. All areas have been periodically reassessed in order to detect any important changes. To date, National Assessment has interviewed and tested more than 1,000,000 young Americans.

Learning-area assessments evolve from a consensus process. Each assessment is the product of several years of work by a great many educators, scholars and lay persons from all over the nation. Initially, these people design objectives for each subject area, proposing general goals they feel Americans should be achieving in the course of their education. After careful review, these objectives are given to writers, whose task it is to create exercises (items) appropriate to the objectives.

When the exercises have passed extensive reviews by subject-area specialists, measurement experts and lay persons, they are administered to probability samples. The people in these samples are selected in such a way that the results of their assessment can be generalized to an entire national population. That is, on the basis of the performance of about 2,500 9-year-olds on a given exercise, we can make generalizations about the probable performance of all 9-year-olds in the nation.

After assessment data have been collected, scored and analyzed, the National Assessment publishes reports and disseminates the results as widely as possible. Not all exercises are released for publication. Because NAEP will readminister some of the same exercises in the future to determine whether the performance levels of Americans have increased, remained stable or decreased, it is essential that they not be released in order to preserve the integrity of the study.

Acknowledgments

After 13 years of data collection, the National Assessment of Educational Progress has a wealth of information with myriad possibilities for analyzing trends in students' achievement. Such trends, juxtaposed with the findings of other research and shifts in education policy and practice, can provide education policy makers and practitioners with important insights into the implications of their actions. This report, which brings together data from reading, science and mathematics assessments and focuses on differences between the performance patterns of high and low achievers in light of events during the seventies, represents another step for the National Assessment in the direction of such reporting.

The abilities and advice of many people contributed to this report. Donald Searle, Kay Barrow and Edgar Ortiz designed and conducted the analyses; Valerie Daniels and Pamela Thayer provided technical assistance; and Arthur Wise, Gloria Gilmer, Frank Rapley and Ronald Anderson provided helpful insights during the review process. Thanks are also due to John Kalk for data processing support, Rexford Brown for editorial guidance and Marci Reser for production. The report was written by Barbara J. Holmes.

B. Anderson

Beverly Anderson
Director

Highlights of the Findings

During the 1970s, the overall picture for reading performance was different than that observed for science and mathematics performance; generally, the reading performance of American youth improved for young students, while teenagers tended to hold their ground.

Mathematical performance changed during the 1970s, with losses observed for older students, while 9-year-olds performed at nearly the same level from one assessment period to the next. Science performance, however, stayed at about the same level for 9- and 13-year-olds, but 17-year-olds lost some ground.

When the performance of students in four quartiles of achievement is examined and analyzed by grade as well as by age, a somewhat sharper image emerges of where changes in performance occurred and of which groups of students realized performance gains and losses.

- Overall, students in the lowest performance quartiles realized greater gains than did those in the highest performance quartiles. Most of the gains were in reading, and for younger students, with some occurring, however, for 13-year-olds.
- In the lowest quartile, black students in the modal grades appropriate for 9-, 13- and 17-year-olds increased in reading and mathematics performance, and fourth graders in the highest quartile also increased in reading and mathematics. Moreover, black eighth graders in the highest quartile increased in reading performance, too. Often, gains by blacks in the modal grades exceeded that of gains by whites in the modal grades.
- Both white and black 17-year-olds in the 11th grade, who performed in the highest quartiles, suffered substantial losses in mathematics and science.

Introduction

During the 1970s, American education underwent a number of alterations, many in response to increased public concern over what students were, or were not, learning in school. One answer was to go "back to the basics." Another, favored by many states and local districts, was to give students minimum competency tests to identify those in need of remediation, or for grade promotion or high school graduation. At the same time, compensatory education programs flourished, as a result of continued federal commitments.

What, in fact, happened to education achievement during this period? And what are the implications for the future? To answer this question, the National Assessment of Educational Progress (NAEP) turned to data from its assessments of reading, science and mathematics. Previous reports have described overall trends in these areas during the seventies.[1] However, none has examined the combined implications of changes in these three areas — areas that are commonly accepted as critical to the development and maintenance of our increasingly technological society.

Additionally, past reports of achievement trends have focused on national averages. New secondary analyses reported herein investigate the trends for high achievers separately from those of low achievers. Past reports have also focused on students of a given age — 9-, 13- and 17-year-olds. This paper focuses upon students in particular grades, as well. Most 9-year-olds are enrolled in the 4th grade (i.e., the 4th grade is the modal grade for 9-year-olds), most 13-year-olds are in the 8th grade and most 17-year-olds are in the 11th grade. Examination of differences in performance for these modal grade youngsters can increase our understanding of the relationships between grade and performance and other factors. Such data can prove useful to those who make decisions about school entry dates, to teachers and to those who design and implement programs to help students achieve subject-area mastery.

This paper highlights the results of some of these analyses. A complete report of the study, including data tables and a description of the methodology and data base on which the analyses rest, is available from the Education Commission of the States (*Technical Report: Changes in Student Performance...*, 1983). This paper extrapolates from the complete study those findings that have the most direct implications for education policy and decision makers.

Some of the Factors Influencing Education in the Seventies

Through such programs as the Right-to-Read Effort, Title I of the Elementary and Secondary Education Act and other compensatory education programs, reading was the focus of great interest and many resources during the seventies, especially in elementary schools.

Conversely, science education was not particularly emphasized during the seventies, either in elementary or secondary schools. The public had been keenly aware of its importance during the early days of space exploration but that general awareness faded. Not only did federal funds for science become scarce during the seventies, but states and local school districts, through their emphases and policies, tended to further contribute to an erosion of scientific interests and pursuits by students. Science fairs disappeared; budgets for science supplies and supplemental materials dwindled; and graduation requirements for science were eased. The number of students entering college with three years of secondary science education declined dramatically during the decade (*Science and Mathematics . . .*, 1982).

---

[1] Changes are reported in *Three National Assessments of Reading: Changes in Performance, 1970-80* (1981); *Changes in Mathematical Achievement, 1973-78* (1979); and *Three National Assessments of Science: Changes in Performance, 1969-77* (1978).

Although a part of Title I, mathematics generally suffered like science during the seventies. There was a decline in the number of qualified mathematics teachers at the secondary level and a corresponding decline in science and mathematics education enrollments at teacher training institutions. As senior teachers with many years of experience retired, it became difficult to replace them with equally well-qualified personnel. And many well-qualified personnel were lured by the real and perceived rewards of careers within business and industry — recognition, research opportunities and increased compensation.

At the same time, the public became seriously concerned with the quality of education. The public called for greater emphasis on basic skills such as grammar, punctuation, spelling, whole number computation, factual knowledge and literal comprehension — viewing them as the building blocks of student learning. With the rallying cry of "back to the basics," the public demanded — and in many instances, received — a redirection of curricular and instructional emphases. These were reinforced by the adoption of minimum competency testing measures in many states and local school districts.

General Changes in Performance in the Seventies

During the 1970s, 9-year-olds made significant gains in reading, while 13- and 17-year-old students performed at nearly the same levels in each assessment. In mathematics, 9-year-olds performed at nearly the same levels from one assessment to the next, but 13- and 17-year-olds lost ground. Only 17-year-olds declined in science; the others stayed at about the same level (*Three National Assessments of Reading*, 1981; *Changes in Mathematical Achievement*, 1979; *Three National Assessments of Science*, 1978).

Because assessments are designed to identify how defined groups of American students respond to assessment exercises, each national probability sample includes the major regions of the country, a cross-section of community types and sizes, various racial/ethnic groups and students of diverse family background. Principals of participating schools and students provide some of the data for these reporting categories.

A complete overview of group patterns relative to national levels of performance is available in the technical report from which these findings are extrapolated.

The remainder of this paper contrasts the performance patterns of white and black students because black youngsters comprised a major portion of the disadvantaged populations targeted for educational intervention during the 1970s.

Throughout the decade, black students, at each of the ages assessed by NAEP, performed below the national level, while their white counterparts performed above the national level. Although the position of these two groups did not change relative to national levels of performance, the *rate* of change for them in reading, science and mathematics was not the same. Table 1 compares mean changes in performance between white and black students.

TABLE 1. Mean Changes in Performance for 9-, 13- and 17-Year-Old White and Black Students in Reading, Science and Mathematics

	Age 9		Age 13		Age 17	
	White	Black	White	Black	White	Black
Reading	2.8*	5.1*	0.7	3.2*	−0.6	0.1
Science	−0.4	−0.4	−0.8	0.9	−1.9*	−2.8*
Mathematics	−2.0*	2.9*	−2.4*	0.6	−3.5*	−2.0*

---

*NAEP adheres to the standard convention whereby differences between statistics are designated as significant only if the differences are at least twice as large as their standard errors. Differences this large would occur by chance in 5% or fewer of all possible replications of the sampling, data collection and scoring procedures for any particular age population or reporting group. These differences are indicated, in the tables, with an asterisk (*).

Table 1 shows that black 9-year-olds made substantial gains in reading and in mathematics; conversely, white 9-year-olds experienced a decline in mathematics, and their gain in reading performance was not as large as that observed for their black counterparts. Also, black 13-year-olds gained in reading, while the performance of their white counterparts remained stable.

Gains in reading by 9- and 13-year-old black students had the positive effect of substantially closing the performance gap between themselves and students nationally. In mathematics, 13-year-old black youngsters remained stable while 13-year-old whites declined in performance. But both white and black 17-year-olds experienced substantial declines in mathematics performance.

A Closer Look at Changes in Performance: *Where* Were They?

It is against the backdrop of general education factors and performance trends just described that National Assessment reexamined the reading, science and mathematics results. Recognizing that important information about the rate of changes and ranges of students' performance can be obscured by relying solely on averages or mean measures, NAEP explored several analytic techniques to more clearly define students' performance during the seventies.[1]

In 1981, National Assessment designed the achievement-class variable as a means of gaining a broader context for reading performance during the seventies. The science and mathematics data have now been analyzed by the achievement-class variable and are reported here for the first time.

The Analysis of Students' Performance by Achievement Class

The achievement-class variable[2] partitions the NAEP sample into quartiles: low achievers, mid-low achievers, mid-high achievers and high achievers.

As a result of partitioning by quartiles, one can observe changes in the distribution[3] of a group of students across the quartiles and its performance within each quartile. Performance changes within an achievement class can be observed for uniformity. For example, given an average 3% change nationally, from one assessment to the next, one can observe whether there is a corresponding change within each of the achievement classes, or if the rate of change is higher or lower than that for the nation. This additional level of information provides a more comprehensive view of how much change has occurred and where it has occurred.

In addition, the results obtained by achievement classes make explicit the fact that each quartile of performance comprises students from all of the traditional reporting categories used by National Assessment. In other words, white and black students are in the lowest and highest achievement classes, as are students from all of the other categories such as regions of the country, community types and so on. Finally, the practical benefit of the analysis by achievement classes is that it allows an insight into what schools may be doing to help the lowest and the highest achieving students.

---

[1] The secondary analyses were performed on the data collected in the last two reading and science assessments so that performance in these two areas could be examined in the same general time frame as mathematics. Science data were collected in 1972-73 and 1976-77; mathematics, 1972-73 and 1977-78; reading, 1974-75 and 1979-80.

[2] Each student participating in a national assessment answers questions in a booklet of exercises (items). The achievement-class variable is created by placing each student in one of four achievement classes depending upon his or her performance on that booklet of exercises. This is, therefore, a post hoc analysis, the accuracy of which rests upon the extent to which students would tend to perform the same way on any of the exercise booklets used in any of the assessments.

[3] Results of the distributional analysis by achievement class for selected NAEP reporting groups are available in Chapter 2 of the technical report, *Technical Report: Changes in Student Performance* . . . (1982).

To ease the reader through the following discussion, the term "quartile" will be used interchangeably with "achievement class." Table 2 shows the national mean changes in performance in reading, science and mathematics, within the lowest and highest quartiles of performance.

A greater gain occurred in reading for 9-year-olds in the lowest quartile than for any other age population. Also, 9-year-olds in the highest quartile of reading performance gained, but not as much as students in the lowest quartile. Nine-year-olds in the lowest quartile of science and mathematics performance remained stable, but those in the highest quartile suffered fairly substantial losses in science (2.5%) and in mathematics (3%).

Also in reading, 13-year-olds in the lowest quartile gained (1.4%), while their peers in the highest quartile remained stable. Like 9-year-olds in the highest quartile, 13-year-olds in this quartile lost ground in science and mathematics.

Seventeen-year-olds in the lowest quartile demonstrated stability in reading, science and mathematics, but their peers in the highest quartile sustained large losses in science (3.9%) and in mathematics (4.2%).

Nationally, then, mathematics and science appear to be the learning areas in which students in the highest performance quartile declined during the seventies, whereas the performance of students in the lowest quartile remained stable in these areas.

The Analysis of Students' Performance by Modal Grade

In addition to the analyses of the reading, science and mathematics data by achievement class, data were examined for students in the modal grade. The modal grade is the grade in which the majority of students of a particular age are enrolled. The modal grade for 9-year-olds is 4th; for 13-year-olds, 8th; and for 17-year-olds, 11th. Presentation of the performance data in reading, science and mathematics by modal grade allows a comparison between changes for the entire age population nationally (which includes students above and below modal grade) and changes for just those students in the modal grade.

However, age data and modal grade data are of equal importance. National data for an entire age population include students who may be above or below modal grade for a variety of reasons. For example, school entry dates and retention policies vary across the nation. If only modal grade data were reported, the progress of a significant number of students could not be monitored.

Modal grade data are especially useful when juxtaposed with national level data for age populations and the reporting groups within

TABLE 2. National Mean Percentages of Changes in Performance in Reading, Science and Mathematics, Within Lowest and Highest Achievement Classes for 9-, 13- and 17-Year-Olds for Two Assessments

	Age 9		Age 13		Age 17	
	Lowest	Highest	Lowest	Highest	Lowest	Highest
Reading	5.0%*	1.4%*	1.4%*	0.3%	−1.0%	−0.4%
Science	1.0	−2.5*	1.5*	−2.5*	0.6	−3.9*
Mathematics	1.1	−3.0*	1.2	−3.4*	−1.3	−4.2*

*Asterisk indicates significant change in performance between assessments.

them. For example, age data indicate that certain groups of students (Hispanos, blacks, those who attend school in disadvantaged-urban communities and several others) tend to perform at levels below that of the nation in reading, science and mathematics. However, it is also the case that a disproportionate number of these students are found below modal grade. What are performance patterns for low performing groups in the modal grade?

Table 3 shows the national mean changes for students in the modal grades in reading, science and mathematics, within the lowest and highest achievement classes. In the lowest quartile, 9-year-olds in the 4th grade made significant gains in reading and in science, whereas 9-year-olds as a whole showed a gain in reading only. Eighth grade 13-year-olds in the lowest quartile also gained in reading and in science, but this was not different from the pattern for 13-year-olds as a whole. Like 17-year-olds as a whole, 11th graders in the lowest quartile showed no significant change in reading, science or mathematics.

In the highest quartile, 9-year-olds in their modal grade experienced a significant gain in reading, but declined significantly in science and mathematics. This pattern pertained also to 9-year-olds as a whole. Like the 13- and 17-year-old populations, students in the highest quartile and in their respective modal grades declined significantly in science and mathematics.

The similarity of the modal grade changes to the overall age changes tells us that the declines in the highest achievement class were not caused only by students below modal grade; nor were the increases for the low achievers caused only by improvements among students below modal grade. Both the improvements and the declines are also taking place within the modal grades.

Now, let's look at further changes in the lowest performance quartiles of reading, science and mathematics for the reporting categories and the groups within them. Exhibit 1 summarizes gains (+) and losses (−) in performance for white and black students, in the modal grades and in the lowest quartile for selected reporting groups. Exhibit 2 shows the same type of findings for students in the highest quartile.[4]

Exhibit 1 shows that for white 4th, 8th and 11th graders in the lowest quartile, the pattern of gains and losses shifted for certain groups of students. Readers should keep in mind the fact that the population groups are not discrete. A given student is in many groups at the same time, e.g., white, Northeast, male, disadvantaged-urban community type, and so forth. The reason for examining patterns across

TABLE 3. National Mean Percentages of Changes in Performance in Reading, Science and Mathematics, Within Lowest and Highest Achievement Classes for 4th, 8th and 11th Graders

	Age 9 4th Graders		Age 13 8th Graders		Age 17 11th Graders	
	Lowest	Highest	Lowest	Highest	Lowest	Highest
Reading	6.1%*	1.4%*	1.7%*	0.4%	−0.1%	−0.8%
Science	1.4*	−2.4*	1.7*	−2.5*	0.4	−4.2*
Mathematics	0.4	−3.1*	1.1	−3.4*	−1.6	−4.3*

*Asterisk indicates significant change in performance between assessments.

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[4] The percentages on which Exhibits 1 and 2 are based are in Appendix A in the technical report, *Technical Report: Changes in Student Performance* . . . (1982).

EXHIBIT 1. A Summary of Gains and Losses in Modal Grade Performance in Reading, Science and Mathematics for White and Black 9-, 13- and 17-Year-Olds in Lowest Achievement Class for Selected Reporting Groups

	White									Black								
	Reading			Science			Mathematics			Reading			Science			Mathematics		
	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17
Region																		
Northeast	+	•	−	+	•	•	+	•	−	+	+	+	•	+	−	+	•	+
Southeast	+	+	•	•	+	+	•	•	−	+	+	+	•	+	•	+	+	•
Central	+	•	−	•	•	•	•	•	•	+	+	−	−	−	•	+	•	−
West	+	+	•	•	+	•	•	•	−	+	+	•	+	•	•	+	•	•
Sex																		
Male	+	•	−	•	+	•	•	•	•	+	+	+	−	•	•	+	+	•
Female	+	•	•	+	•	•	•	•	−	+	+	•	•	+	•	+	+	+
Title I																		
Yes	+	•	−	+	+	•	•	•	•	+	+	+	•	+	•	+	+	+
No	+	•	−	•	+	•	•	•	−	+	+	•	+	•	•	+	+	•
Type of community																		
Rural	+	•	•	+	+	−	−	•	•	+	•	+	+	•	+	+	+	−
Disadvantaged urban	+	+	−	•	•	•	+	•	−	+	+	•	•	+	•	+	+	+
Advantaged urban	+	•	•	+	+	•	+	•	•	+	−	•	•	+	+	+	Undefined	•
Size of community																		
Big cities	+	+	•	•	•	+	−	•	•	+	+	•	•	+	•	+	•	+
Fringes around big cities	+	+	•	+	+	•	•	•	−	+	•	•	•	+	+	+	+	•
Medium cities	+	•	•	+	+	•	+	+	−	+	+	+	•	•	−	+	+	+
Smaller places	+	•	−	+	+	•	•	•	•	+	+	•	−	•	•	+	•	•
Percent white enrollment																		
0-59% white school	+	•	−	+	•	+	•	•	−	+	+	•	•	•	•	+	•	+
60-100% white school	+	•	−	•	+	•	•	•	−	+	+	+	•	+	•	+	•	+
Parental education																		
Not graduated high school	+	•	−	•	+	+	•	•	−	+	+	•	−	+	−	+	+	•
Graduated high school	+	•	−	+	+	•	•	•	−	+	•	•	•	•	•	+	+	+
Post high school	+	•	−	•	•	•	•	•	−	+	+	•	•	•	+	+	+	+
Reading resources																		
<3 categories	+	+	•	+	+	•	•	•	•	+	+	•	•	•	−	+	+	+
3 categories	+	•	•	•	+	•	•	•	•	+	•	+	−	•	•	+	•	+
4 categories	+	•	−	+	+	•	•	•	−	+	+	+	•	+	+	+	•	+

Legend
+ = significant gain
− = significant loss
• = no significant change

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groups is to see how pervasive a change has been socially — that is, how many different kinds of students and schools contributed to the achievement ups and downs.

Reading

- More of the white population groups showed gains in reading than in science or in mathematics, and most of these gains were among groups of fourth graders.

- Eighth graders, too, had some gains in reading: for example, students in the Southeastern and Western regions gained and so did those who attend school in disadvantaged-urban schools.

- Some losses occurred among the groups of 11th graders: for example, among males and for students in the Northeastern and Central regions of the country.

Science

- Overall, white students in their modal grades demonstrated a lot of stability and more gains than losses in science at each age. Stability was particularly evident among the 11th graders, and the gains occurred for 4th graders.

- The only loss for white students in the modal grade and in the lowest quartile of performance occurred for 11th graders who attend school in rural communities.

Mathematics

- Gains in performance occurred for white fourth graders in the Northeast, those who attend schools in both disadvantaged- and advantaged-urban communities and for those who live in medium-sized cities. Among this latter group, gains were also observed for the eighth graders.

- More losses in mathematical performance occurred for whites in the 11th grade than for the younger students intheir respective modal grades. For example, 11th graders in the Northeastern, Southeastern and Western regions of the country experienced a loss, with only those in the Central region showing stability. Females in the 11th grade and those who attend school in disadvantaged-urban communities also experienced a loss in mathematical performance.

By contrast, Exhibit 1 indicates the following pattern of gains and losses for groups of black students, also at ages 9, 13 and 17 and in the modal grades.

Reading

- All of the black population groups gained at the fourth-grade level, and most groups gained in reading also at the eighth-grade level. Only black eighth graders who attend school in advantaged-urban communities experienced a decline in reading performance.

- Gains occurred also for certain groups of black students in the 11th grade; for example, students in the Northeast and Southeast and males and students who attend schools in rural communities.

- Only one group of 11th graders experienced a decline: those in the Central region.

Science

- Overall, the science performance of black students at each age and in their modal grades was characterized by more stability and gain than by losses. This pattern held for most of the reporting categories.

- As a whole, more groups of 8th graders gained more than 4th or 11th graders. For example, 13-year-old females, students who attend school in advantaged- and disadvantaged-urban communities and students who reside in the Northeast and the Southeast gained in science performance.

- Seventeen-year-olds in the 11th grade in the Northeast lost ground in science, as did those who live in medium-sized cities.

- Fourth and eighth graders in the Central region also lost ground in science.

Mathematics

- Overall, more gain and stability than loss was observed in mathematical performance at each age for black youngsters in the modal grades.

- Only 11th graders in the Central region and those who attend school in rural communities lost in mathematical performance.

- All remaining groups, at each age, either made a positive change or demonstrated stability in performance.

Corresponding to Exhibit 1 (but for the highest quartile), Exhibit 2 indicates a difference between the performance patterns of white and black 4th, 8th and 11th graders. Here is an overview of patterns in reading, science and mathematics for white students in the highest quartile.

Reading

- As was the case with white students in the lowest quartile, reading performance of white students in the highest quartile fared better than did science or mathematical performance.

- Overall, there were few changes in reading performance — especially among the teenagers in the 8th and 11th grades. Most changes occurred for 4th graders and these changes were positive. For example, gains were observed for students in the Southeast, for males, for students in advantaged-urban community schools and several other categories as well.

- No losses occurred in the reading performance of the highest quartile for any age population.

Science

- Overall, the science performance of white students was marked by losses at each age in the highest quartile, across the majority of reporting categories.

- One exception to the overall pattern of loss was observed among fourth graders who attend Title I eligible schools: this group gained in science performance.

Mathematics

- Overall, mathematical performance was marked by more losses than science. This pattern pertained across the three age populations of white students and across the majority of reporting categories.

- The only gain realized in mathematics was for fourth graders whose parents have not graduated from high school.

- Only two groups — fourth graders who attend school in disadvantaged-urban communities and eighth graders in the Southeast — remained stable.

- All other groups, at each age, showed losses in mathematical performance.

By contrast, Exhibit 2 shows the following patterns of gains and losses for groups of black students, also at ages 9, 13 and 17 and in the modal grades.

Reading

- Most groups of black 4th and 8th graders made gains in reading performance. Among black 11th graders, performance for various groups either remained the same or declined.

Science

- Several groups of black fourth graders experienced gains in science performance: for example, students in the Northeast, those

EXHIBIT 2. A Summary of Gains and Losses in Modal Grade Performance in Reading, Science and Mathematics for White and Black 9-, 13- and 17-Year-Olds in Highest Achievement Class for Selected Reporting Groups

	White									Black								
	Reading			Science			Mathematics			Reading			Science			Mathematics		
	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17
Region																		
Northeast	•	•	•	–	–	–	–	–	–	+	+	–	+	•	–	+	•	–
Southeast	+	•	•	–	–	–	–	•	–	+	+	–	•	–	•	+	–	–
Central	•	•	•	–	–	–	–	–	–	+	•	•	•	–	–	+	–	–
West	+	•	•	–	–	–	–	–	–	+	+	–	•	–	–	+	•	–
Sex																		
Male	+	•	•	–	–	–	–	–	–	+	+	•	•	•	–	+	–	–
Female	•	•	•	–	–	–	–	–	–	+	+	–	•	–	–	+	–	–
Title I																		
Yes	•	•	•	+	–	–	–	–	–	+	+	•	•	–	–	+	–	–
No	+	•	•	–	–	–	–	–	–	+	+	–	•	•	–	+	–	–
Type of community																		
Rural	•	•	•	–	–	–	–	–	–	+	+	–	•	–	•	•	+	•
Disadvantaged urban	•	+	•	–	–	•	•	–	–	+	+	•	+	–	–	+	–	–
Advantaged urban	+	•	•	–	–	–	–	–	–	•	•	–	+	+	–	•	•	•
Size of community																		
Big cities	+	•	•	–	–	–	–	–	–	+	+	–	•	•	–	+	–	–
Fringes around big cities	•	•	•	–	–	–	–	–	–	+	+	•	+	•	•	+	+	–
Medium cities	•	•	•	–	•	–	–	–	–	+	•	–	+	–	•	+	–	•
Smaller places	•	•	•	–	–	–	–	–	–	+	+	–	•	•	–	+	–	–
Percent white enrollment																		
0-59% white school	•	•	•	–	•	–	–	–	–	+	+	•	+	–	–	+	–	–
60-100% white school	+	•	•	–	–	–	–	–	–	+	+	–	•	•	–	+	–	–
Parental education																		
Not graduated high school	•	+	•	•	–	•	+	–	–	•	+	•	–	•	–	+	–	–
Graduated high school	+	•	•	–	–	–	–	–	–	+	+	–	•	–	–	+	–	–
Post high school	•	•	•	–	–	–	–	–	–	+	+	–	•	•	–	+	–	–
Reading resources																		
<3 categories	•	•	•	–	–	–	–	–	–	+	•	•	•	–	–	+	–	–
3 categories	+	•	•	–	–	–	–	–	–	+	+	•	•	–	–	+	–	–
4 categories	•	•	•	–	–	–	–	–	–	+	+	–	+	•	–	+	•	•

Legend:
+ = significant gain
– = significant loss
• = no significant change

who attend school in disadvantaged- and advantaged-urban communities, those who live in fringes around big cities and in medium-sized cities.

- Most groups of black eighth graders declined or remained stable in science performance. However, those who attend school in advantaged-urban communities gained in performance.

- Losses in science performance were concentrated among various groups of blacks at age 17 and in the 11th grade.

- A concentration of losses in science performance occurred at age 17, among the 11th graders, rather than among the younger students in the 4th and 8th grades. However, the performance of four groups of 17-year-old blacks remained stable; students in the Southeast, those who attend school in rural communities and those who live in fringes around big cities and in medium-sized cities.

Mathematics

- Overall, the pattern for mathematics is similar to that of science: gains for the younger black students, with losses concentrated among the 11th graders, but some stability also observed for the 8th and 11th graders.

- The majority of groups in the fourth grade made gains in mathematical performance, with only two — students who attend school in rural and in advantaged-urban communities — showing no change. At a risk of redundancy, no group of black fourth graders experienced a decline in mathematical performance.

- In the eighth grade, while the majority of groups experienced a decline, two groups gained: these were students who attend school in rural communities and those who live in fringes around big cities.

- In the 11th grade, while the majority of groups experienced a decline, students who attend school in rural communities and in advantaged-urban communities, those who live in medium cities and who report having four categories of reading resources in their homes remained stable in mathematics performance.

In summary, Exhibits 1 and 2 indicate that more performance *losses* occurred in mathematics than in science or in reading for students in the lowest *and* highest achievement classes, whether white or black. Conversely, more performance *gains* occurred in reading than in mathematics or in science for students in the lowest and highest achievement classes, whether white or black. Additionally, more gains occurred for students in the *lowest quartile of performance*, whether white or black, regardless of learning area. Finally, the performance of black youngsters in the 4th and 8th grades at ages 9 and 13 tended to increase or to remain stable, while the performance of their white counterparts either declined or remained stable in all three learning areas. Both white and black high achievers in the 11th grade suffered substantial losses in mathematics and science.

Exhibit 3 graphically displays an overview of the findings just described and allows us to see the general direction of performance changes for white and black students, in the lowest and highest quartiles, in 4th, 8th and 11th grades. Supporting figures for Exhibit 3 appear in Table 4.

EXHIBIT 3. Changes in Lowest and Highest Achievement Classes in Reading, Science and Mathematics for White and Black Students in Modal Grades

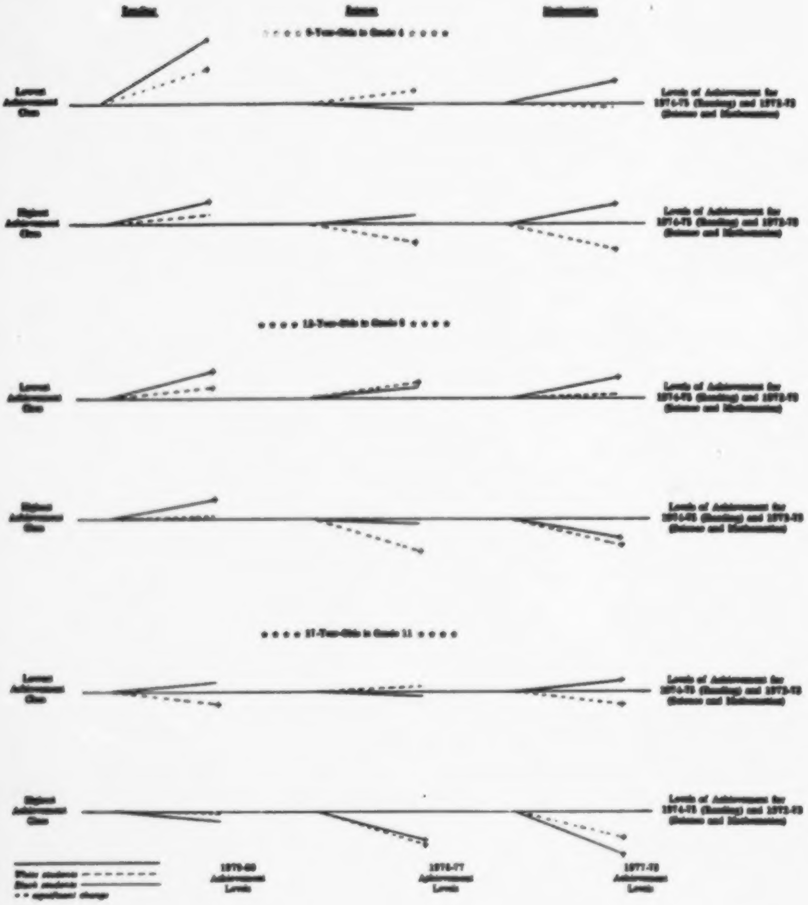

TABLE 4. Mean Percentage Changes Between Two Assessments in Lowest and Highest Achievement Classes in Reading, Science and Mathematics for White and Black Students in Modal Grades

	Black			White		
	Reading	Science	Mathematics	Reading	Science	Mathematics
			Lowest Achievement Class			
9-year-olds	5.4*	−0.7	2.9*	4.6*	1.7*	−0.5
13-year-olds	2.5*	1.3	2.6*	1.5*	2.0*	0.3
17-year-olds	1.1	−0.5	1.6*	−1.7*	0.7	−1.8*
			Highest Achievement Class			
9-year-olds	3.0*	1.1	2.6*	1.2	−2.4*	−3.3*
13-year-olds	2.5*	−0.5	−2.5*	0.4	−4.1*	−3.2*
17-year-olds	−1.1	−3.9*	−5.5*	−0.3	−4.2*	−4.3*

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*Asterisk indicates significant change in performance between assessments.

Considerations for the Future

To gain a cross-sectional view of education policy direction and options for the eighties, National Assessment invited several persons to participate in a conference with staff to consider the implications of the findings described in this paper. Participating were Ronald Anderson, Gloria Gilmer, Frank Rapley and Arthur Wise.[1] Their opinions are theirs alone and do not necessarily represent either the view of the institutions with which they are affiliated or those of the National Assessment of Educational Progress, the Education Commission of the States or the National Institute of Education.

A synthesis of the conference discussion is presented below as a series of "considerations" for different kinds of policy makers and those who implement education policies.

Considerations for Public Educators — State Boards of Education, Teacher Training Institutions

Although reading achievement increased for most American students during the seventies, achievement levels in science and mathematics remained stable or declined. At the same time that demand for competent people in technological areas is growing, the number of qualified science and mathematics teachers in preparation at teacher training institutions (Howe and Gerlovich, 1982) has dropped and the number of high school graduates equipped for highly technical fields has gone down as well (*State-Mandated Graduation Requirements 1980*, 1980). In light of these trends, perhaps educators should consider:

- Reviewing the relationship between teacher training and technical fields curricula and the programs of secondary schools. Often students complete high school without the appropriate sequence and/or number of science and mathematics courses needed to pursue careers in technical fields or as teachers.
- Reviewing teacher training and teacher certification policy, especially for the elementary level. Often elementary school teachers have had little or no training in science and mathematics, although they are certified to teach at the elementary level.

Considerations for Teachers, Interventionists, Curriculum Developers and Specialists

Data collected by the National Assessment (*Technical Report: Changes in Student Performance . . .*, 1982, Table 10) indicate that more black 9-year-olds were retained in grade during the mid-to-late seventies than in the assessment years prior to that time. By 1980, 34% of the

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[1] Dr. Ronald Anderson, professor of Science Education, School of Education, University of Colorado; Dr. Gloria Gilmer, co-chair, Panel on Remediation, Mathematical Association of America; Dr. Frank Rapley, superintendent of schools, Kalamazoo, Michigan; Dr. Arthur Wise, senior social scientist, Rand Corporation.

9-year-old blacks were below modal grade compared with 27% of the white 9-year-olds. Although the proportions of black 13- and 17-year-olds below modal grade did not increase, at age 13, 36% were below modal grade compared with 20% of the white students, and at age 17, 30% of the black students were below modal grade compared with 11% of the white students.

Results presented in this paper clearly suggest that black students in the modal grades appropriate to their ages increased significantly in performance during the seventies. In the lowest quartile, all three ages increased in reading and mathematics performance, and fourth graders in the highest quartile also increased in reading and mathematics. Moreover, black eighth graders in the highest quartile increased in reading, too. Often the gains by blacks in the modal grade exceeded that of gains by whites in the modal grades. (See Appendix A in the technical report.) In light of these performance patterns, educators may want to reconsider:

- Retention policies that separate students from the age/grade group when remediation is indicated. Successful intervention programs, such as Project SEED (Special Elementary Education for the Disadvantaged) teach the entire class at the same time and at the same pace, in a very supportive environment.

Evidence from this study and other reports published by the National Assessment during the seventies suggests that student gains were concentrated around the fundamental, low order skills. Conversely, some losses were observed in inferential comprehension in reading (*Three National Assessments of Reading* . . ., 1981), in problem solving in mathematics (*Changes in Mathematical Achievement* . . ., 1979) and in the physical sciences (*Three National Assessments of Science* . . ., 1978). These findings suggest that educators reconsider certain assumptions about how children learn.

- Children can and do learn large chunks of very difficult material very early. Lower order, so-called basic skills, are not necessarily the "building blocks" essential to acquiring higher order, cognitive skills such as problem solving, analyzing and synthesizing. Neither are the teaching strategies associated with the acquisition of lower order skills the same as those required to inculcate higher order skills. Learning is not the linear process popularly perceived by the public.[8] As pointed out in a recent report by the National Council of Teachers of Mathematics,

> . . . problem solving [should] not be deferred until computational skills are mastered. Problem solving and learning of more advanced skills reinforce the learning of computational skills and provide meaning for their application (*Results From the Second Mathematics Assessment* . . ., 1981, p. 148).

Teachers should be encouraged to:

- Rely on their intuitive responses to students; students do best when teacher expectations are high for all students.

- Vary pedagogies; many of the successful science and mathematics intervention programs incorporate "questioning/discovery" strategies to aid in developing conceptual skills.[9]

- Allow students to experiment by changing roles, allowing students to lead discussions and to plan lines of inquiry.

- Change the pace of curricular coverage, when indicated, and include an interdisciplinary approach to content. Application of reading to mathematics and science will stimulate learning in all three areas. Rigid adherence to the scope and sequence of a lesson plan or textbook tends to stifle teachers' creativity.

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[8] For an overview of selected neuroscientific research with educational implications, see *Education and the Brain* (1978).

[9] For example, Project SEED (Special Elementary Education for the Disadvantaged); MESA (Mathematics, Engineering, Science Achievement Program); North Carolina School of Science and Mathematics; Houston's High School for Engineering Profession.

- Reduce reliance on test results. The strong emphasis on testing during the seventies has produced a cued-recall type of teaching and overdependence on a lock-step progression through the content material.

- Teach the same material to all students, varying the level to recognize different student abilities.

This closer look at achievement patterns suggests that many positive things were going on in the schools during the seventies. Disadvantaged youngsters and low achieving students made considerable gains, especially in reading and especially in elementary school. But these findings point to short-comings as well: they clearly indicate that we did not do as good a job in science or mathematics as in reading, nor did we help high achieving students continue to demonstrate the potential they showed in elementary school. The challenge now is to give attention to science and mathematics, while not losing ground in reading, and to find ways to strengthen students in the higher order skills. Only by attending to these issues will we bring the schools back into synch with the economic and social needs of the 1980s and 1990s.

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SCIENCE AND MATHEMATICS EDUCATION IN AMERICAN HIGH SCHOOLS: RESULTS FROM THE HIGH SCHOOL AND BEYOND STUDY

Introduction

In its report, Educating Americans for the 21st Century,[1] the National Science Board Commission on Precollege Education in Mathematics, Science and Technology states that "far too many emerge from the Nation's elementary and secondary schools with inadequate grounding in mathematics, science and technology." It also states that "students in our Nation's schools are learning less mathematics, science and technology" than students in other developed countries. A similar concern also is stated in the report, A Nation at Risk, prepared by the National Commission on Excellence in Education (NCEE).

A recent analysis of high school transcript data gives further reason for concern about insufficient coursework in mathematics and science among American high school students. For example, only 46 percent of the graduates in 1982 took 3 or more years of mathematics and only 30 percent took 3 or more years of science.[2] Furthermore, the percentages of students who took high-level courses in either of these fields were generally small--algebra II, 31 percent; advanced algebra, 8 percent; trigonometry, 7 percent; calculus, 6 percent; other advanced mathematics, 13 percent; advanced biology, 8 percent; advanced chemistry, 4 percent; and advanced physics, 1 percent. (See appendix tables.)

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[1] The National Science Board Commission on Precollege Education in Mathematics, Science and Technology, Educating Americans for the 21st Century. Washington D.C.: National Science Foundation, 1983, p. 1.

[2] Throughout this report percentages are rounded in the text but expressed to 1 decimal point in the table. Detailed statistics are presented in subsequent sections.

Reproduced from Science and Mathematics Education in American High Schools: Results From the High School and Beyond Study. National Center for Education Statistics, May 1984.

These and other findings are based on an analysis of over 12,000 transcripts from a sample of 1982 high school graduates.[3] The transcripts were collected as part of High School and Beyond (HS&B), a national longitudinal study of high school sophomores and seniors of 1980, sponsored by the National Center for Education Statistics (NCES). Specifics about the classification of courses, the data base, and the reliability of the estimates are presented in the technical notes at the end of this bulletin. Additional research findings from other studies are also presented where appropriate.

The analysis produced four statistics: the average number of years of science and mathematics; the percentages of students who had taken 3 or more years each of science and mathematics; the percentages of students who had earned credits in specific science and mathematics courses; and student attitudes toward mathematics. All statistics were computed for the total sample of 1982 high school graduates and for subgroups defined by sex, race/ethnicity, high school program, socioeconomic status (SES), school type, educational aspiration, and geographic region. Major findings are summarized and discussed in the text while detailed statistics for subgroups are presented in the appendix. Readers should note that this analysis reviewed only the "quantity" of courses taken in high school; there was no measure of the "quality" of these courses.

Average Number of Years of Science and Mathematics

The 1982 high school graduates on the average took 2.2 years of science and 2.7 years of mathematics during their 4 years of high school.[4] Students in academic programs, as expected, took more years of both science and mathematics than did students in general or vocational programs: 2.9 vs. 2.1 and 1.7 for science, and 3.3 vs. 2.5 and 2.2 for mathematics (figure 1).[5]

The number of years of mathematics and science taken by 1982 high school graduates also varied by student background and other characteristics (table A-1). Students who planned to obtain at least a 4-year college degree had about 1 more year of science and 1 more year of mathematics than did other students. Asian-American and white students took more years of science and mathematics than did black, American Indian or Hispanic students: 2.7 and 2.3 vs. 2.1, 2.0 and 1.9 years of science, and 3.2 and 2.7 vs. 2.6, 2.3 and 2.4 years of mathematics, respectively. Students from higher SES backgrounds also took more courses than did students of lower SES; 2.7, 2.2 and 1.9 years of science and 3.1, 2.6 and 2.3 years of mathematics, respectively, for high, middle, and low SES. Furthermore, students from Catholic schools took slightly more years of both science and mathematics than did students from public schools.[6] Students in New England and Mid-Atlantic States took more years of science and mathematics than did students in some other regions. Male students overall took slightly more years of mathematics or science than did female students.

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[3] This sample was derived from a national probability sample of the 1980 sophomores who graduated in 1982.

[4] In this report, 1 year of work is equivalent to 1.0 Carnegie credit unit. A Carnegie unit generally requires a minimum of 200 minutes per week for a regular class and 275 minutes per week for a lab class for 36 weeks.

[5] All group classification variables except school type and geographic region are based on student self-reports in 1980. Group differences cited in the text are statistically significant at the 0.05 level on the basis of two-tailed t tests.

Percentage of 1982 Graduates Who Had 3 or More Years of Coursework in Science and Mathematics

American high school students had substantially less coursework in science and mathematics than did students in such highly developed countries as Japan, West Germany, and the U.S.S.R. In those countries, all students took at least one course each in science and mathematics each year in the upper secondary school.[7] In the American high school, however, students were not required to do so. School districts on the average required 1.7 credits in mathematics and 1.6 credits in science for graduation.[8]

As shown in figure 2 and table A-2, only about 30 percent of the 1982 graduates took 3 or more years of science and about 46 percent took 3 or more years of mathematics during their 4 years of high school. Even among the academic program students, only 54 percent met the requirement for 3 years of science recommended by the NCEE, while 73 percent met the recommended 3 years of mathematics. For the general and vocational program students, the percentages were much lower. In science, the percentages were 19 and 9, respectively, for general and vocational students; and in mathematics, the percentages were 32 and 23, respectively (figure 2).

Differences in the amount of coursework taken by students of varying backgrounds are quite evident. Details are shown in table A-2. Students who planned to obtain at least a 4-year college degree and students from high SES families were more likely than other students to have had 3 or more years years each of science and mathematics. Asian Americans were more likely than other racial/ethnic groups to take 3 or more years of science and mathematics (45 percent in science and 68 percent in mathematics), followed by whites (34 percent in science and 50 percent in mathematics). Students from private schools also were more likely to take 3 or more years each in science and mathematics than were students from public schools. Furthermore, students in the New England and the Middle Atlantic regions were more likely than students from other regions to take 3 or more years of science and mathematics.

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[6] This difference may reflect the fact that proportionally there are more academic program students in private schools than in public schools; 75 vs. 35 percent, respectively, for Catholic and public schools.

[7] The National Science Board Commission on Precollege Education in Mathematics, Science and Technology, Educating Americans for the 21st Century. Washington D.C.: National Science Foundation, 1983.

[8] Wright, D., "School District Survey of Academic Requirements and Achievement," National Center for Education Statistics bulletin NCES 83-210, April 1983.

Percentages of Students Who Earned Credits in Specific Science and Mathematics Courses

Unlike the schools in many other countries, schools in the United States offer a variety of curricula to meet students' individual needs. In an attempt to classify secondary school curricula, NCES identified 47 different mathematics courses, 32 life science courses, 35 physical science courses, and 4 unified science courses from school course catalogs.[9] For simplification, courses were grouped into a few categories in this analysis. These categories and the specific courses in each category are described in the technical notes.

a. Sciences

Percentages of students who earned credits in each specific science course were generally low. Only basic biology enrolled more than 70 percent of the students. Other basic courses such as chemistry I and physics I each enrolled less than one-fourth of the students (24 and 11 percent, respectively). Although unified sciences enrolled about 20 percent of the students and general sciences enrolled 30 percent, these courses are generally considered introductory level courses (figures 3 and 4, and tables A-3 and A-4).

Percentages of students who took advanced science courses were even lower; 8 percent in advanced biology, 4 percent in advanced chemistry, and slightly over 1 percent in advanced physics.

Courses taken in high school, to a large extent, are determined by the type of program in which students are enrolled. Academic program students were more likely than others to have earned credits in basic biology, advanced biology, chemistry I, advanced chemistry, physics I, and advanced physics. General and vocational program students were at least as likely as academic program students to have taken unified sciences, general physical sciences, and geology (figure 5).

This analysis also examined differences among various subgroups with regard to taking specific courses. Detailed results are shown in tables A-3 and A-4. Again it was found that high SES students and students with higher educational plans were more likely than others to have taken basic and advanced science courses. Male students were more likely than female students to have taken physics, and Asian-American and white students were more likely than black, or Hispanic students to have taken basic physics and chemistry.

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[9] Evaluation Technologies, Inc., A Classfication of Secondary School Courses. A report prepared for the National Center for Education Statistics under Contract No. 300-81-0312, July 1982.

b. Mathematics

Except for algebra I, which was taken by 63 percent of the students, mathematics courses generally enrolled only a moderate or small percentage of the students. Geometry was taken by about 48 percent of the students; algebra II by 31 percent; advanced algebra by 8 percent; trigonometry by 7 percent; calculus by 6 percent; and other advanced mathematics by 13 percent. Statistics was taken by only 1 percent of the students (figure 6).

As was true of science courses, the tendency to take mathematics courses was related to high school program. Each of the mathematics courses examined (except general mathematics and pre-algebra) was taken by substantially more academic program students than by students in other programs (table A-5). High SES students and students with high educational aspirations were more likely to have taken advanced courses than students of low SES or low aspirations.

Differences in the tendency to take specific mathematics courses by sex were not clear. Although data show that more males than females took advanced courses, the differences were not statistically significant except for trigonometry (9 vs. 6 percent).

Student Attitudes Toward Mathematics

Student attitudes toward mathematics may partially explain why so little high school mathematics was taken. During the base-year survey in spring 1980, students were asked to indicate whether mathematics was interesting and/or useful to them. Tabulations of their responses are presented in table A-6. (It should be noted that no similar data with respect to sciences were collected.)

Over 59 percent of the students reported that mathematics would be useful to them in the future, but only about 32 percent reported that they found mathematics interesting. There was no significant difference in the percentages of males and females who considered mathematics useful or interesting.

Ratings of usefulness and interest are consistent with the patterns of coursetaking. Specifically, the groups that had more coursework in mathematics were more likely to rate this subject as useful and interesting than were groups with fewer courses. For example, high SES students were more likely than low SES students to rate mathematics as useful and interesting. Similarly, academic program students were more likely to do so than were general and vocational program students.

Technical Notes

Classification of Courses

All courses in each transcript were assigned a 6-digit code based on a Classification of Secondary School Courses (CSSC), developed under a contract with NCES in July 1982. The number of credits earned in each course was expressed in Carnegie units. A Carnegie unit requires a minimum of 200 minutes per week for a regular class and 275 minutes per week for a lab class for 36 weeks. However, some schools may require more time for a unit. In a section of this bulletin, years of coursework were used in the analysis. A year's work is equivalent to 1.0 Carnegie unit.

As mentioned earlier, there were 47 courses in mathematics, 32 courses in life science, 35 courses in physical sciences, and 4 courses in unified sciences identified from school course catalogs. To simplify the presentation of meaningful information, the courses were further grouped into categories as shown on pages 8 and 9.

It should be noted that this analysis used fairly liberal criteria in deciding whether the courses taken by students were in fact mathematics or science courses. Any course that had mathematics or science as its primary course content was included in the analysis. However, it is possible that some courses were excluded that would have been included if a still more liberal interpretation of course content had been made. For example, courses which were primarily vocational and made no mention of mathematics or science in the course title or description were excluded, although portions of such courses might well contain materials relating to mathematics and/or science.

Sample Size

HS&B base-year data were collected in 1980 from over 30,000 sophomores and 28,000 seniors in 1,015 public and private schools across the Nation. As part of the first follow-up survey, transcripts were requested in fall 1982 for a subsample of 18,152 members of the sophomore cohort. A total of 15,941 transcripts were actually obtained. The number of these that were complete and that indicated graduation in 1982 was 12,116, the number used in the analysis reported here. Sample sizes for the specific subgroups used in this bulletin are presented in table A-1.

Examinations of questionnaire information (such as grade point average, SES, and educational aspirations) on the 2,211 students without transcripts suggests that the absence of their transcript data actually makes the percentages of students who took various science and mathematics courses higher than they otherwise would have been. Had their transcripts been available and included, the percentages would be even smaller.

Of the 15,941 transcripts obtained, 1,969 were excluded from this study of high school graduates because the students had dropped out of school before graduation. Of the remaining 13,972 transcripts, 799 were excluded because they were incomplete. Analysis of student background characteristics suggests that, had their transcripts been included in the tabulations, the percentages would again be smaller.

Finally, 1,057 transcripts were excluded either because the student graduated before 1982 (83 cases) or because the transcript failed to indicate either dropout status or graduation (974 cases). Again, background data suggest that the presence of data from these individuals would have lowered the percentages still further.

Standard Errors and Statistical Significance Testing

The approximate standard error of a percentage (p) in this report can be obtained by $s.e.(p) = D(p(100-p)/n)^{1/2}$ where n is the sample size and D is a correction factor estimated to be 2.0. To contrast two subpopulation percentages, $d=p_1 - p_2$, the standard error of the difference, s.e.(d), may be approximated by taking the square root of the sum of the squares of the standard errors for p_1 and p_2; that is, $s.e.(d) = (s.e.(p_1)^2 + s.e.(p_2)^2)^{1/2}$. The approximation will be conservative because of the exclusion of the covariance term for p_1 and p_2 in the estimation formula.

Group differences cited in the text are statistically significant at the 0.05 level on the basis of two-tailed t tests unless otherwise noted.

For More Information

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Categories of Life Science

Basic biology

Biology, basic; biology, general; biology, college preparatory

Advanced biology

Biology, advanced; genetics; biology seminar

Other general biology

Science 7; biology, other general; field biology; biopsychology

Biochemistry and biophysics

Biochemistry; biochemistry and biophysics

Botany

Botany; botany, other

Zoology

Zoology; zoology, vertebrate; zoology, invertebrate; animal behavior; human physiology; advanced physiology; pathology; zoology, other

Other life sciences

Cell biology; cell and molecular biology, other; microbiology; microbiology, other; ecology; marine biology; marine biology, advanced; anatomy; miscellaneous specialized areas; life science, other

Categories of Physical Sciences

General physical sciences

Science 8; science 9; chemistry and physics laboratory techniques; physical science, applied; general physical sciences, other

Chemistry I

Chemistry I

Chemistry II/advanced chemistry

Chemistry II; organic chemistry; physical chemistry; chemistry, independent study

Other general chemistry

Consumer chemistry; chemistry, other; chemistry, introductory

Geology

Earth science; earth science, college preparatory; geology; mineralogy; geological sciences, other

Physics I

Physics I

Physics II/advanced physics

Physics II; physics II without calculus

Other general physics

Physics, general; electricity and electronics science; acoustics; physics, other

Other physical sciences

Astronomy; astronomy, other; astrophysics, other; meteorology; atmospheric sciences and meteorology, other; oceanography; miscellaneous physical sciences, other; rocketry and space science; planetary science, other; physical sciences, other

Unified sciences

Unified sciences; independent science study; outdoor education; biological and physical sciences, other

Categories of Mathematics

General and applied mathematics

Mathematics 7; mathematics 7, accelerated; mathematics 8; mathematics 8, accelerated; mathematics, basic; mathematics I, general; mathematics II, general; science mathematics; mathematics in the arts; mathematics, vocational; technical mathematics; mathematics review; mathematics tutoring; consumer mathematics; mathematics, other general; actuarial sciences, other; applied mathematics, other

Pre-algebra

Pre-algebra; mathematics I, unified; pure mathematics, other

Algebra I

Algebra I, part 1; algebra I, part 2; algebra I

Algebra II

Algebra II

Advanced algebra/linear algebra

Algebra III; linear algebra

Geometry

Geometry, plane; geometry, solid; geometry; geometry, informal

Trigonometry

Trigonometry

Calculus

Calculus and analytic geometry; calculus; calculus, advanced placement

Other advanced mathematics

Analytic geometry; trignometry and solid geometry; algebra and trigonometry; algebra and analytic geometry; analysis, introductory; mathematics, independent study

Unified mathematics II & III

Mathematics II, unified; mathematics III, unified

Probability and statistics

Statistics, probability; probability and statistics; statistics, other

Figure 1.– Average number of years of science and mathematics taken by 1980 sophomores who graduated in 1982, by high school program

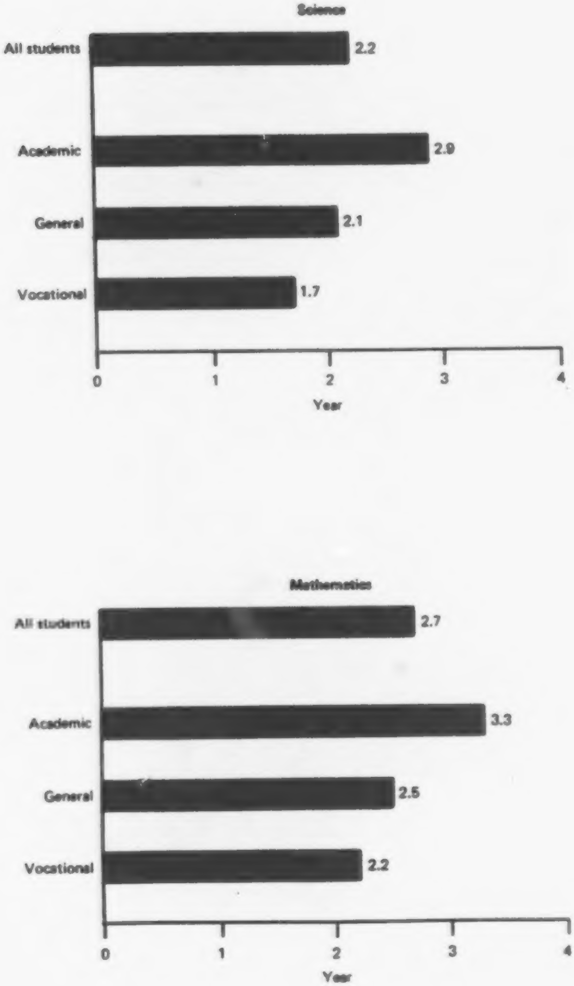

Figure 2.— Percentages of 1980 sophomores graduating in 1982 who took at least 3 years of mathematics and science, by high school program

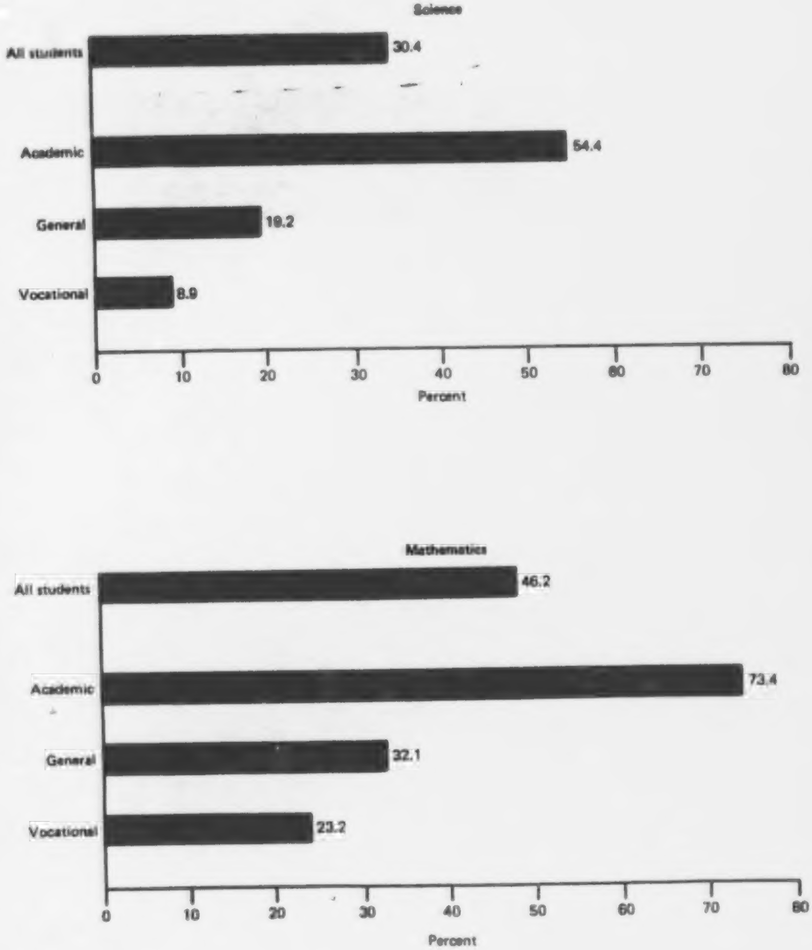

Figure 3.– Percentages of 1980 sophomores graduating in 1982 who took various physical science courses

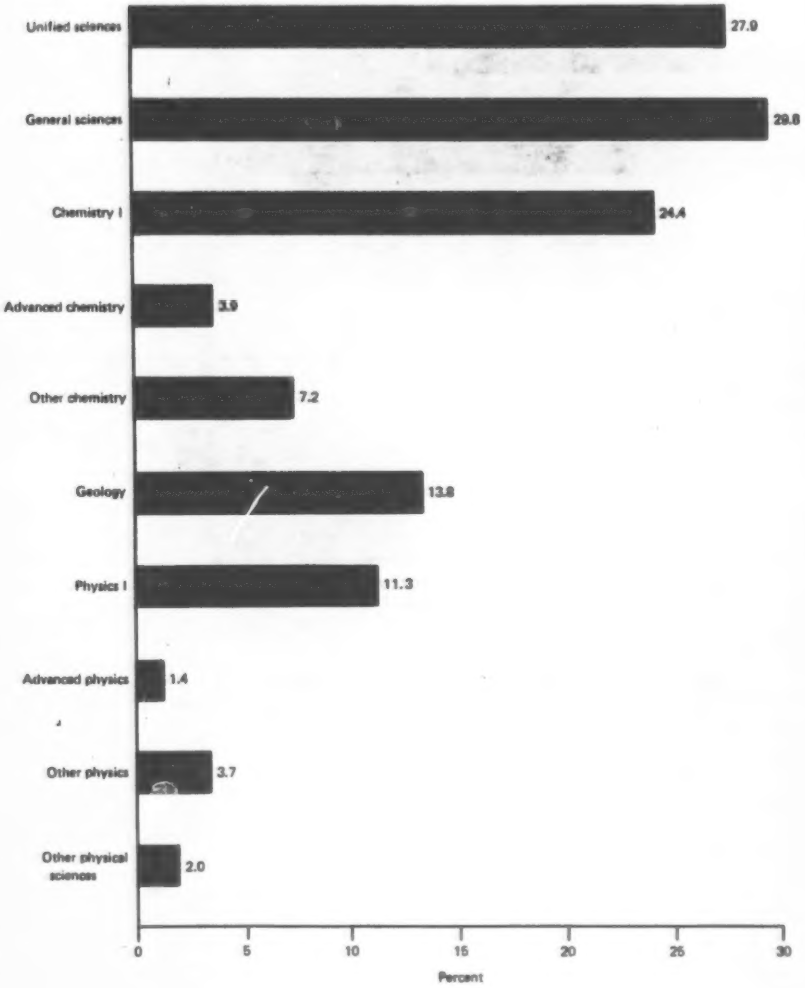

Figure 4.—Percentage of 1980 sophomores graduating in 1982 who took various life science courses

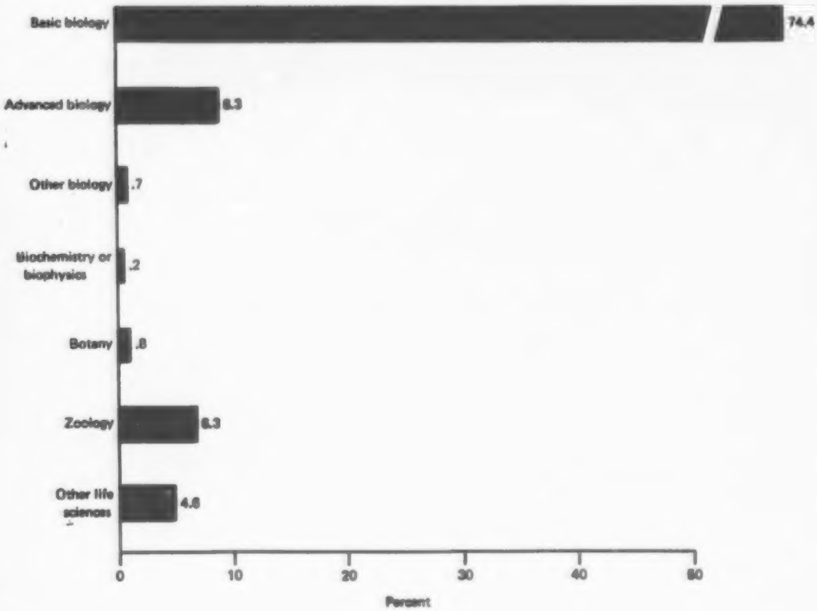

Figure 5.— Percentages of 1980 sophomores graduating in 1982 who took specific science courses, by high school program

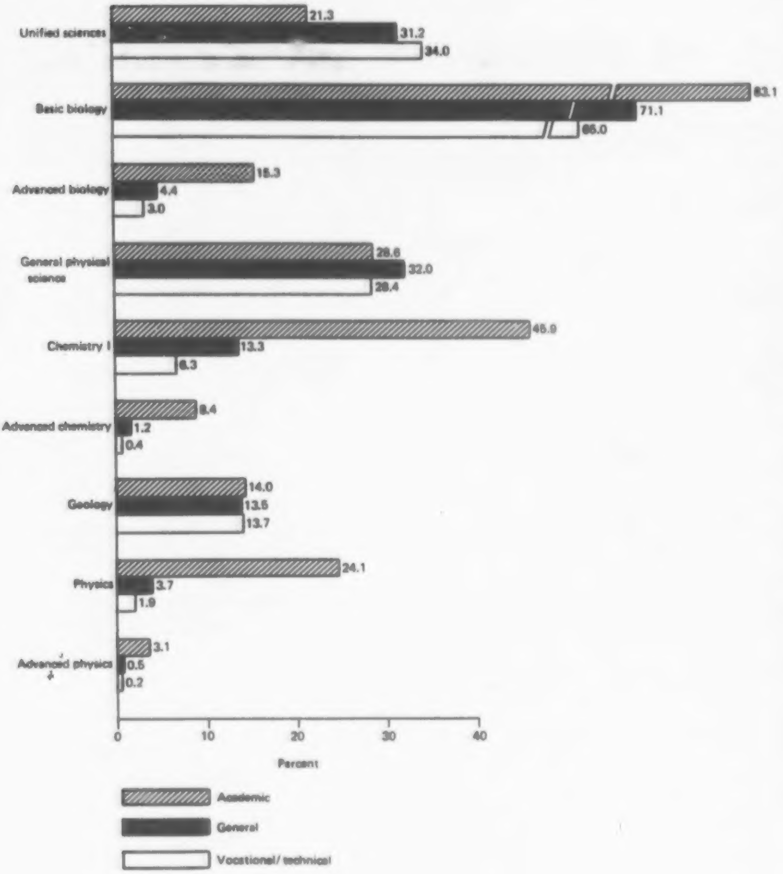

Figure 6.– Percentages of 1980 sophomores graduating in 1982 who took specific mathematics courses

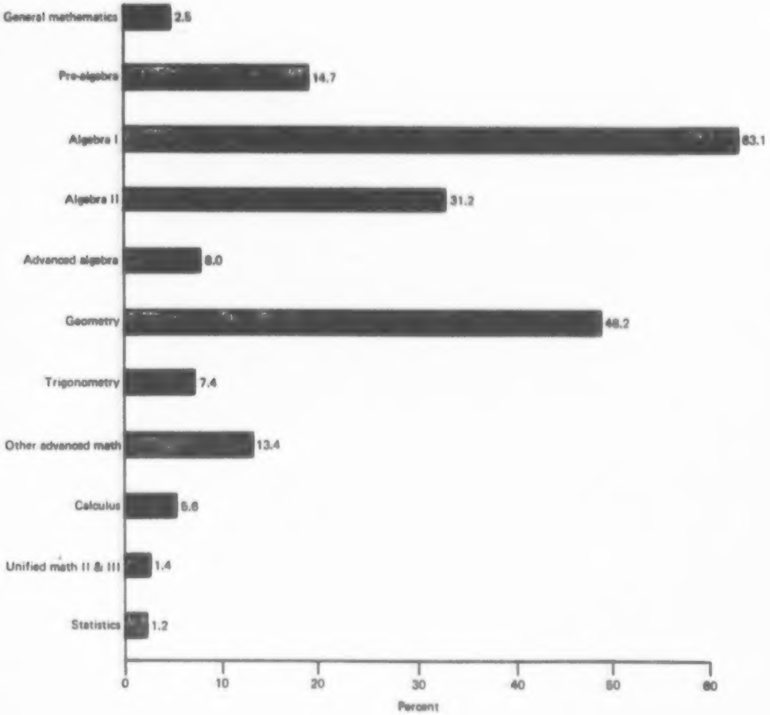

Table A-1.--Average number of years of science and mathematics taken by 1980 sophomores who graduated in 1982, by selected characteristics

Subgroup	Science	Mathematics	Sample size
All students	2.2 (0.02)	2.7 (0.02)	12,116
Sex:			
Male	2.4 (0.04)	2.7 (0.04)	5,914
Female	2.1 (0.02)	2.6 (0.02)	6,202
Race/ethnicity:			
Hispanic	1.9 (0.04)	2.4 (0.04)	2,420
Black	2.1 (0.05)	2.6 (0.05)	1,599
American Indian	2.0 (0.10)	2.3 (0.11)	173
Asian American	2.7 (0.06)	3.2 (0.09)	327
White	2.3 (0.03)	2.7 (0.02)	7,497
High school program:[1]			
Academic	2.9 (0.05)	3.3 (0.04)	5,356
General	2.1 (0.03)	2.5 (0.02)	3,710
Vocational	1.7 (0.04)	2.2 (0.03)	2,744
Socioeconomic status:[2]			
High	2.7 (0.04)	3.1 (0.04)	3,069
Middle	2.2 (0.03)	2.6 (0.03)	5,206
Low	1.9 (0.03)	2.3 (0.02)	2,542
School type:			
Public	2.2 (0.02)	2.6 (0.02)	9,166
Catholic	2.5 (0.07)	3.3 (0.08)	2,197
Other private[3]	2.6 (0.21)	3.1 (0.21)	753
Educational aspiration:			
High school only	1.7 (0.04)	2.1 (0.03)	1,848
Some college	1.9 (0.02)	2.4 (0.02)	4,039
4 yr. college or more	2.8 (0.03)	3.2 (0.04)	5,449
Region:			
New England	2.6 (0.09)	3.0 (0.08)	623
Middle Atlantic	2.6 (0.07)	2.9 (0.06)	2,154
South Atlantic	2.3 (0.05)	2.7 (0.05)	1,673
East South Central	2.2 (0.08)	2.5 (0.04)	562
West South Central	2.3 (0.12)	2.8 (0.12)	1,334
East North Central	2.0 (0.00)	2.5 (0.05)	2,571
West North Central	2.3 (0.13)	2.7 (0.13)	901
Mountain	2.1 (0.05)	2.4 (0.04)	543
Pacific	1.8 (0.06)	2.6 (0.05)	1,755

Note.--Figures in parenthese are standard errors.

[1] Based on student self-reports in 1980.

[2] SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of the three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3] Estimates for this type of school are not as accurate as those from other types of schools because of small sample size and a high non-response rate.

Table A-2.--Percentage of 1980 sophomores graduating in 1982 who took at least 3 years of mathematics and science, by selected subgroups

Subgroup	Science	Mathematics
All students	30.4	46.2
Sex:		
Male	33.3	47.5
Female	27.7	45.0
Race/ethnicity:		
Hispanic	16.0	31.4
Black	22.9	38.5
American Indian	16.0	28.6
Asian American	45.2	68.1
White	33.7	49.5
High school program:[1]		
Academic	54.4	73.4
General	19.2	32.1
Vocational	8.9	23.2
Socioeconomic status:[2]		
High	46.1	66.4
Middle	29.2	44.5
Low	17.6	30.2
School type:		
Public	28.7	43.2
Catholic	43.4	73.9
Other private[3]	47.4	66.0
Educational aspiration:		
High school only	12.4	20.3
Some college	19.3	33.2
4 yr. college or more	49.9	71.4
Region:		
New England	45.5	65.3
Middle Atlantic	45.5	55.1
South Atlantic	30.5	48.8
East South Central	26.9	40.8
West South Central	25.4	43.6
East North Central	27.0	40.6
West North Central	29.7	46.2
Mountain	22.2	30.8
Pacific	18.0	41.8

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[1] Based on student self-reports in 1980.

[2] SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of the three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3] Estimates for this type of school may not be as accurate as those from other types of schools because of small sample size and a high non-response rate.

Table A-3.--Percentages of 1980 sophomores graduating in 1982 who took specific physical science courses, by selected background characteristics.

Subgroup	General sciences	Chemistry I	Advanced chemistry	Other chemistry	Geology	Physics I	Advanced physics	Other physics	Other sciences	Unified science
All students	29.8	24.4	3.9	7.2	13.8	11.3	1.4	3.7	2.0	27.9
Sex:										
Male	29.9	24.7	4.8	7.9	15.0	14.5	2.0	5.3	2.3	29.6
Female	29.8	24.0	3.2	6.6	12.8	8.6	0.9	2.1	1.8	26.3
Race/ethnicity:										
Hispanic	34.0	12.9	1.7	3.3	11.9	4.9	0.5	1.2	1.4	30.7
Black	32.8	18.6	2.2	5.7	10.8	5.5	1.1	1.9	2.1	33.0
American Indian	30.4	17.1	2.1	19.0	8.8	7.1	0.0	6.0	0.0	29.9
Asian American	24.0	40.9	7.5	13.8	9.2	26.0	4.9	8.0	2.0	16.7
White	28.9	26.8	4.4	7.8	14.6	12.9	1.6	4.2	2.1	26.8
High school program:[1]										
Academic	28.6	43.9	8.4	11.9	14.0	24.1	3.1	6.5	2.4	21.3
General	32.0	13.3	1.2	5.5	13.5	3.7	0.5	2.4	1.7	31.2
Vocational	28.4	6.3	0.4	2.6	13.7	1.9	0.2	1.1	1.7	34.0
Socioeconomic status:[2]										
High	30.5	40.1	7.5	9.8	13.0	21.4	2.7	5.8	2.3	22.1
Middle	29.2	22.5	3.3	7.3	14.7	9.8	1.3	3.6	2.0	27.1
Low	30.4	13.4	1.5	4.1	12.4	4.0	0.5	1.6	1.7	36.2
School type:										
Public	28.3	23.1	3.5	7.0	14.7	10.5	1.3	3.8	2.2	29.3
Catholic	34.3	36.3	6.8	13.5	6.7	16.4	2.0	4.9	0.5	13.0
Other private[3]	43.2	35.6	9.7	6.3	14.5	24.1	3.7	2.3	2.5	23.5
Educational/aspirations:										
High school only	31.2	7.0	1.0	3.0	16.5	2.4	0.2	1.6	2.1	33.8
Some college	30.3	13.9	1.3	5.8	13.7	4.0	0.6	2.5	1.9	29.2
4 yr college or more	28.6	43.4	7.8	10.7	13.1	22.9	2.8	5.9	2.1	23.7
Region:										
New England	23.3	31.0	9.5	13.6	23.1	18.9	3.0	0.3	1.6	20.3
Middle Atlantic	26.7	29.5	6.5	10.4	22.0	17.7	2.3	0.6	1.7	34.0
South Atlantic	31.2	25.2	3.0	6.2	16.2	8.8	1.2	0.3	5.1	25.9
East South Central	31.1	19.8	1.6	5.4	4.7	8.7	0.1	0.2	0.0	44.7
West South Central	40.6	22.0	1.2	1.4	4.6	6.4	0.4	0.1	0.6	26.3
East North Central	19.4	25.6	4.1	6.3	12.5	11.3	1.4	0.9	1.8	27.0
West North Central	39.3	22.0	2.1	11.5	9.6	10.5	1.7	0.7	0.9	25.7
Mountain	27.5	19.4	4.3	6.8	23.4	7.2	1.6	0.3	3.0	26.7
Pacific	22.5	18.1	2.3	5.9	8.2	9.7	1.0	0.3	1.8	24.1

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[1] Based on student self-reports in 1980.

[2] SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3] Estimates for this type of school may not be as accurate as those from other types of schools because of small sample size and a high non-response rate.

Table A-4.--Percentages of 1980 sophomores graduating in 1982 who took specific life science courses, by selected background characteristics

Subgroup	Basic biology	Advanced biology	Other biology	Biochemistry, biophysics	Botany	Zoology	Other life sciences
All students	74.4	8.3	0.7	0.2	0.8	6.3	4.6
Sex:							
Male	72.7	7.4	0.7	0.3	0.7	4.9	4.3
Female	76.1	9.2	0.8	0.1	0.9	7.6	4.8
Race/Ethnicity:							
Hispanic	69.1	4.6	0.6	0.1	0.4	4.8	3.2
Black	74.1	5.7	1.2	0.0	0.7	5.8	4.5
American Indian	65.4	6.3	1.0	0.4	0.4	1.3	2.1
Asian American	78.1	12.8	0.8	0.3	0.6	9.6	4.2
White	75.4	9.3	0.7	0.3	0.8	6.6	4.8
High school program:[1]							
Academic	83.1	15.3	1.0	0.5	1.1	9.4	6.0
General	71.7	4.4	0.6	([4])	0.6	4.9	4.1
Vocational/technical	65.0	3.0	0.5	([4])	0.6	3.5	3.3
Socioeconomic status:[2]							
High	80.9	13.2	0.9	0.6	1.1	8.4	5.4
Middle	74.7	7.8	0.7	0.1	0.7	6.4	4.9
Low	70.2	4.7	0.5	0.1	0.6	3.6	3.4
School Type:							
Public	72.5	8.0	0.8	0.2	0.7	6.3	4.1
Catholic	88.4	10.6	0.5	1.3	0.1	8.4	8.2
Other private[3]	89.4	13.9	0.7	0.0	0.5	5.2	3.9
Educational Aspirations:							
High school only	62.6	3.0	0.1	0.0	0.5	3.1	3.0
Some college	72.6	5.0	0.7	([4])	5.8	5.1	4.3
4 yr college or more	82.5	13.6	1.0	0.5	1.0	9.2	5.8
Region:							
New England	74.3	13.4	2.5	0.4	0.2	9.5	5.4
Middle Atlantic	73.1	10.4	0.8	0.3	0.1	3.0	4.6
South Atlantic	81.2	9.3	0.9	0.1	1.4	6.3	6.5
East South Central	71.1	6.6	0.0	0.0	0.3	4.4	3.9
West South Central	83.3	4.9	0.1	0.0	0.3	2.7	2.0
East North Central	67.7	10.1	0.5	0.6	1.4	7.8	4.8
West North Central	74.1	5.4	1.0	0.0	1.0	8.3	5.0
Mountain	74.4	6.2	0.9	0.0	1.4	8.4	3.5
Pacific	73.9	4.7	0.6	([4])	0.2	8.0	4.2

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[1] Based on student self-reports in 1980.

[2] SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of the three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3] Estimates for this type of school may not be as accurate as those from other types of schools because of small sample size and a high non-response rate.

[4] Less than 0.1.

Table A-5.--Percentages of 1980 sophomores graduating in 1982 who took specific mathematics courses, by selected background characteristics

Subgroup	General Math	Pre-Algebra	Algebra I	Algebra II	Advanced algebra	Geometry	Trigonometry	Other advanced	Calculus	Unified math II & III	Statistics
All students	2.5	14.7	63.2	31.2	8.0	48.2	7.4	13.4	5.6	1.4	1.2
Sex:											
Male	2.8	14.7	61.0	31.4	8.7	47.1	8.5	14.0	6.1	1.6	1.3
Female	2.2	14.7	65.2	30.9	7.3	49.3	6.3	12.8	5.0	1.2	1.1
Race/ethnicity:											
Hispanic	3.5	15.4	53.7	18.8	3.0	28.4	4.6	7.0	2.4	0.7	0.3
Black	3.0	18.2	53.2	22.2	5.[illegible]	33.3	3.6	5.4	2.0	0.7	0.5
American Indian	2.9	17.1	43.9	17.4	1.8	23.9	3.6	4.5	2.0	0.9	0.6
Asian American	5.6	15.3	65.0	44.2	17.0	67.5	15.6	29.5	14.8	1.7	1.8
White	2.2	14.0	66.4	34.4	9.0	53.4	8.3	15.4	6.4	1.5	1.4
High school program:[1]											
Academic	2.5	12.3	73.3	52.0	14.3	74.8	15.3	26.6	12.6	2.5	2.5
General	2.0	16.6	59.6	20.4	4.7	35.7	2.9	6.1	1.0	0.5	0.2
Vocational	3.2	15.7	52.9	13.2	2.0	24.3	1.5	3.1	0.5	0.6	0.3
Socioeconomic status:[2]											
High	2.3	14.9	71.7	44.5	13.7	69.5	12.8	25.1	11.4	2.5	2.8
Middle	2.2	13.5	65.7	31.7	7.4	49.0	6.9	11.8	4.4	1.3	0.9
Low	2.8	15.3	52.3	19.0	3.8	26.7	2.4	4.3	1.5	0.4	0.5
School Type:											
Public	2.5	15.0	60.6	29.3	7.7	44.9	7.0	12.0	4.8	1.5	1.0
Catholic	2.7	12.9	83.2	47.7	10.2	79.5	10.2	27.0	8.5	0.7	2.2
Other private[3]	1.2	11.3	74.7	43.0	17.9	70.9	11.7	23.5	23.9	(4)	3.3
Educational aspirations:											
High school only	2.7	14.5	46.5	12.4	3.0	20.1	1.0	2.2	1.4	0.8	0.3
Some college	2.4	16.6	61.7	22.0	4.4	36.8	3.9	5.6	1.4	0.5	0.6
4 yr college or more	2.4	13.3	73.8	49.6	14.0	73.4	13.9	26.4	11.7	2.5	2.1
Region:											
New England	2.3	10.4	63.3	53.5	6.9	63.8	11.8	19.5	14.7	1.7	3.4
Middle Atlantic	4.5	13.2	50.2	29.4	8.2	40.8	8.6	17.2	11.2	5.9	2.2
South Atlantic	2.3	13.0	60.1	34.7	5.7	44.7	7.9	9.8	3.9	0.6	0.5
East South Central	0.9	5.9	60.8	35.3	8.6	39.6	5.5	6.7	4.4	0.2	0.5
West South Central	0.6	16.0	73.1	34.7	4.7	42.5	9.0	8.1	1.7	(4)	0.1
East North Central	1.5	15.8	66.3	24.4	10.0	52.5	6.3	15.2	4.0	0.7	0.9
West North Central	3.4	12.7	71.9	30.5	11.1	57.7	5.7	14.8	2.3	0.3	2.5
Mountain	1.3	21.5	55.6	26.9	6.4	41.0	5.3	9.6	4.9	0.0	0.9
Pacific	4.0	20.4	68.3	26.6	8.4	51.8	6.1	13.9	4.4	0.2	0.2

[1] Based on student self-reports in 1980.

[2] SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of the three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3] Estimates for this type of school may not be as accurate as those from other types of schools because of small sample size and a high non-response rate.

[4] Less than 0.1.

Table A-6.--Attitudes towards mathematics of 1980 sophomores graduating in 1982, by selected background characteristics

Subgroup	Percentage of students judging mathematics to be:	
	Useful	Interesting
All students	59.3	32.4
Sex:		
Male	61.0	31.8
Female	57.7	33.0
Race/ethnicity:		
Hispanic	56.0	30.5
Black	57.0	30.5
American Indian	53.3	32.2
Asian American	66.6	36.1
White	60.2	33.1
High school program:[1]		
Academic	66.3	39.4
General	56.4	30.1
Vocational	56.2	27.1
Socioeconomic status:[2]		
High	64.7	35.8
Middle	59.2	32.3
Low	54.8	29.7
School type:		
Public	59.0	31.7
Catholic	64.2	38.8
Other private[3]	55.8	40.2
Educational aspiration:		
High school only	50.1	28.0
Some college	57.1	29.5
4 yr. college or more	68.3	39.0
Region:		
New England	58.9	34.7
Middle Atlantic	58.0	32.9
South Atlantic	61.5	32.5
East South Central	57.7	30.6
West South Central	56.8	30.6
East North Central	59.2	34.0
West North Central	60.0	33.2
Mountain	60.2	29.2
Pacific	60.3	31.3

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[1] Based on student self-reports in 1980.

[2] SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of the three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3] Estimates for this type of school may not be as accurate as those from other types of schools because of small sample size and a high non-response rate.

The Reform of Public Schools

by Mortimer Adler

"We do not have a democratic system of education.
We do not give all children the same quality
of schooling. We have a two-track system
separating children into the sheep and the goats."

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There are five related and widely prevalent errors in American education that *The Paideia Proposal* attempts to correct. The first error is to think that only some children are educable, even though all have a right to aspire to become truly educated human beings.

The second error is to suppose that the process of education is completed in our educational institutions during the years of basic schooling or even during the years of advanced schooling after that. Nothing could be further from the truth. Education never is completed in the school. Youth and immaturity are insuperable obstacles to becoming educated.

The third error is to suppose that teachers are the sole, primary, or principal causes of the learning that occurs in students. That is not the case. The primary cause of all learning — unless it be rote memory, which is not learning at all — is the activity of the student's mind. The best that the best teacher can do is to assist that activity.

The fourth error is probably at the heart of the matter, and the correction of this error is at the heart of *The Paideia Proposal:* the error is to suppose that there is only one kind of teaching and one kind of learning, the kind that consists in the teacher lecturing, or telling, and the students learning what they hear said or what they find in textbooks. That's the least important kind of learning and teaching. There are two much more important kinds of learning and teaching, and all three must be in basic schooling, from kindergarten through the twelfth grade.

Finally, there is the error of supposing that schooling — basic or advanced — is primarily a preparation for earning a living, and that it will not hold the attention of students unless that is mani-

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festly so. Obviously one of the objectives of schooling is to prepare the young to earn a living, but that is the least important objective. One of the great troubles with our schools is that both teachers and parents make the mistake of thinking that job preparation is the primary objective.

My book, *The Paideia Proposal*, is dedicated to Horace Mann, John Dewey, and Robert Hutchins. To Horace Mann because in the middle of the last century he struggled valiantly to see that on the eastern seaboard the children had at least six years of free compulsory schooling. It turned out that six years became the rule well into this century. It is only in the last forty or fifty years that compulsory schooling has been extended to twelve years, but that in part is a debt we owe to Horace Mann.

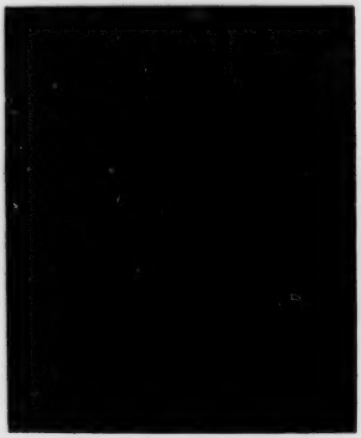
To John Dewey because, in 1916, in his book *Democracy and Education*, Dewey put those two words together for the first time in history. By doing so, he showed that in our kind of society, all the children who go to school are destined to have the same kind of future; therefore, the objectives of schooling should be the same for all. They should all have exactly the same quality of schooling.

And to Robert Hutchins for a single sentence that sums it all up: "The best education for the best is the best education for all." An extraordinary passage that Bob was fond of quoting came from John Amos Comenius in the year 1657:

> "The education that I propose includes all that is proper for a man, and it is one in which all men who are born into this world should share. Our first wish is that all men be educated fully to full humanity. Not any one individual, not a few, or even many, but all men, together and singly, young and old, rich and poor, of high and lowly birth, men and women; in a word, all whose fate it is to be born human beings, so that at last the whole of the human race become educated, men of all ages, all conditions, both sexes, and all nations."

In the title of my book, *paideia* is the Greek word for general human learning; the Latin of *paideia* is *humanitas*. I mention that because one of the terrible errors in the world today, and particularly in America, is a misunderstanding of the meaning of humanities. People think that it denotes what is left over when you finish with the sciences. Humanities, *humanitas*, is strictly the equivalent of *paideia*, which means general, unspecialized, untechnical human learning.

The subtitle of the book describes it as "an educational manifesto." We used the word "manifesto" to echo the *Communist Manifesto*, because we are intending a revolution, and a revolution is nothing but a reversal in direction in any social institution. The quality of schooling has been declining for the last sixty years. We must start climbing back. The ideal is a goal to be aimed at and achieved by a series of cumulative steps in the right direction. It will not be reached quickly. It may take twenty-five, thirty, even fifty years to produce the change we have in mind.



Now it is much easier, of course, to state principles and policies than to implement them. Therefore, the Paideia group has written a second book, *Paideia Problems and Possibilities*. It will be published in the fall of 1983. In the course of the last year, we have met with members of sixty or seventy educational organizations across the country. We have picked up more than fifty questions and problems which we state carefully and answer.

We are planning a third book, *The Paideia Program*, scheduled for publication in 1984. It will be a group of essays written by the members of the Paideia group. The first two have already been written: one on mathematics and the mechanical arts; the other on language and the language arts. Everything in the Paideia program, diagrammed on page 23 of *The Paideia Proposal*, will be commented on in detail in our third book.

All these will be short books like our 84-page first book. We decided that if the *Communist Manifesto* had been written in three hundred pages, there never would have been a revolution. Anyone who needs more than an hour to read it can't read. There is no jargon in it, no educationese, no pedagese. If I could have raised the money to do it, I would have liked to have dropped *The Paideia Proposal* from airplanes on the roofs of every house in the United States.

Several things our proposal is not. It is not a return to basics. Of course, we are concerned with skills, including the skills of reading, writing, and arithmetic. But we are concerned with much more than skills.

Our program is not a return to the classics, as that word is so often taken to mean, that is, simply going back to Greek and Roman antiquity. We are concerned with classics where the classics mean anything of enduring value.

Our program is also not just an appeal for an improvement in the quality of education for some students. It is an appeal for the improvement in quality for all, without any exception whatsoever. And, since it is for all, it is not elitist. People who call it elitist because it is dedicated to a high quality of education misuse the word elitist.

The first and most important distinguishing characteristic of *The Paideia Proposal* is that it takes democracy seriously. It takes seriously the commitment of the democratic society to the objective of a high quality of basic schooling for all children.

Most Americans do not know that democracy is not fifty years old. Democracy, properly defined in the modern sense as constitutional government, with true universal suffrage, and the securing of all natural or human rights, was not in existence at the beginning of this century. At that time women were still disfranchised, human rights were not secured, and economic rights were not even dreamed of.

It is therefore not surprising that we do not have a democratic system of education. We have instead an antidemocratic, or undemocratic, system of education, a holdover from the nineteenth century and the first years of this century. We have a two-track educational system. We separate the children into the sheep and the goats, and we do not give them the same quality of schooling. It is about time — now that democracy is just beginning to come into existence — that we try to create, over the next hundred years, a system of schooling that fits a democratic society.

Our proposal is also concerned not just with secondary schooling, but with all twelve years of compulsory schooling as an integrated unit. And in terms of all the developmental psychology we know, the best way to divide those twelve years is in two parts of six years each.

Another characteristic of our proposal is that, given the same objectives for all students, we must use the same means, which is a required curriculum, for all. The required curriculum calls for the elimination of all electives in the upper six years of schooling, with the exception of a choice of a second language to be mastered, and the elimination of all specialized job training throughout. The kind of vocational training that now goes on in schools is worse than useless; it is undemocratic in the extreme. As John Dewey observed in 1916 — and the situation is ten times worse today — vocational training is the training of slaves, not free men.

Our proposal does not prescribe the particulars of a curriculum for the whole country. It says there should be a required curriculum everywhere, but we have not defined that curriculum. It would be presumptuous to do that in a country as pluralistic as ours, with more than fifteen thousand separate autonomous school boards and/or school districts, each with the authority to determine what is to be studied in its own area. If we had a Ministry of Education in the United States as they have in France, you could do that. What we did instead is present a curricula framework, within which any sound curriculum must be constructed in different ways, in different school districts, to meet different populations under different circumstances.

Finally, our proposal regards basic schooling as preparation for continued learning, either in higher institutions or in adult life. To become an educated person is an accomplishment of one's mature years, after all schooling, basic or advanced, has been completed.

In sum, *The Paideia Proposal* calls for:

☐ The same quality, not just the same quantity, of schooling for all the children, so that all will have an equal educational opportunity.

☐ The schooling must be general, not specialized; liberal, not vocational; humanistic, not technical; thus fulfilling the meaning of the words *paideia* and *humanitas* — the general learning that should be in the possession of every human being.

☐ The objectives of basic schooling should be the same for all, because all have the same three elements in their future, as John Dewey pointed out: the demands of work; the duties of citizenship; and the obligation of each individual to make as much of himself or herself as possible.

☐ These three common objectives can be achieved only by a completely required course of study, whose only elective is a second language. Incidentally, we are the only country in the world that does not require a second language in its basic schooling.

☐ The curriculum of course of study must include three kinds of learning: acquisition of organized knowledge; development of the intellectual skills of learning; and an enlarged understanding of ideas and values. These three kinds of learning and the corresponding three kinds of teaching must be integrally related to one another.

☐ Individual differences, especially inequalities in natural endowment and in nurtural environments from which the children come, call for compensatory efforts in the form of preschool tutoring for those who need it, and remedial or supplementary instruction for those who need that.

☐ Every school must have a principal who is truly the principal teacher in that school, its educational leader, not merely its administrative or clerical head. We tend to forget that the word "principal" is an adjective. An adjective needs a noun. And the noun that goes with principal is teacher. It's the only thing that could possibly go with it. It's our American term for the British term headmaster. In Britain the teachers are masters, and the headmaster is the head teacher. A school without a principal is no school at all. I know that in every school there are clerical and administrative chores to be done; but let them be done by clerks working for the principal. The principal should be the educational leader of the school. Unless that is the case, I do not think you can have a real learning community.

Two important comments on the foregoing are in order. The first concerns the often misused words "liberal" and "humanistic." Liberal has had two uses traditionally. As an adjective for education, it meant nonvocational, that is, learning for the sake of learning itself. Vocational meant learning for the sake of earning. But that does not address the fact that carpentry, for example, may be a component of liberal schooling and liberal learning, if it is carpentry for the sake of acquiring the skill of thinking with one's hands and tools. If it is carpentry to earn a living, it is not liberal. Chemistry is liberal only if it is chemistry for the sake of learning that particular branch of the physical sciences. If it is chemistry to become a chemical engineer, it is not liberal.

The second meaning of the word liberal is as an adjective modifying arts. Liberal arts are not fine arts. The fine arts are totally useless; that is their glory. The liberal arts are useful. It is important that we not include under the liberal arts all the things they are not. When we refer to "liberal arts high schools" or "liberal arts colleges," we do not mean liberal arts as such. Any course, and any combination of elective courses of study, can be part of a liberal arts college curriculum. But the liberal arts themselves are the arts of the trivium and the quadrivium, which, in modern form, include reading, writing, speaking, listening, and all the mathematical arts and scientific skills. Those are the liberal arts. They are skills. Arts are skills. The Greek word *techne* is the word that names them all. Nevertheless, in America today there is a gross misuse of these terms. We speak of a "liberal arts curriculum" in which no liberal arts are taught at all, and in which most of the elective components in that curriculum are either not arts or skills, or if they are arts, they are literary and other fine arts, not liberal arts.

The same kind of misuse applies to the word "humanities." Humanistic learning is simply general, not specialized, learning. In the Greek lexicon, the distinction is between *paideia*, or general learning, and *episteme*, which is the knowledge of the scientist, the expert. In Latin, the distinction is between *humanitas* and *scientia*. *Paideia* is the root word in encyclopaedia; the meaning of encyclopaedia is the great circle of general learning. *Paideia*, or *humanitas*, in this traditional sense, includes mathematics, all the sciences — natural and social — just as much as it includes history, philosophy, and the fine arts. Anything that belongs to general human learning is humanities.

Now, when Robert Hutchins came to the University of Chicago, he did something which perpetuated this mistake. He's been forgiven for it, because it was in the air. He divided the university into four divisions. Three of these were the physical sciences, biological sciences, social sciences. What was left over he called the humanities. And it really was what was left over. But what was left over is no different from the other three subjects. The humanities at the University of Chicago, under Mr. Hutchins, included philology, history, philosophy. But these subjects were just as specialized and narrow in their scholarship as were the sciences in their specialized research. The humanities at Chicago was no more *humanitas*, in the sense of general learning, than physics and mathematics were. Humanities, as general learning, must include all the subject matters, not just some.

The curricula framework as diagrammed (see figure) is clear. Each of the three columns designates a kind of learning that must continue, in ascending difficulty, for the full thirteen years, that is, from kindergarten through grade twelve. The first column is the acquisition of organized knowledge in the basic fields of subject matter, which are language, literature and the fine arts, mathematics and the natural sciences, history, geography, and the study of social institutions. The kind of teaching that assists, but only assists, this kind of learning is didactic teaching. It is teaching by telling, teaching by lecturing, teaching by textbook assignments and by examinations on those textbook assignments, teaching by class exercises and blackboard work. Unfortunately this least important kind of teaching is the only kind that most teachers do. It is the only kind that schools of education pay any attention to. They do not do this very well, but they do pay attention to it. They pay little or no attention to the other two kinds of teaching and learning.

The second kind of learning and teaching (column 2) is the development of the intellectual skills. Now a skill, a *techne*, or an art — the three words mean the same thing — is a habit. You do not have an art except by having it through habit formation. This is true of all the bodily skills. Forget about the intellectual skills for the moment. Think of the skills that are taught in a gymnasium or on the playing field. What kind of teaching helps the formation of the habits which are these skills? It is coaching. You would not think of someone trying to teach another how to play basketball or how to swim by lecturing that person. You need a coach, a fellow who says, don't do it this way, do it that way; stop putting your right foot forward when you should put your left foot forward; keep your eye on the ball; throw your shoulder back. Whatever it is you are doing, you must do it over and over and over again under a coach's eye until you form the correct habit. Coaching is the only way that skills

The Same Course of Study for All

	COLUMN ONE	COLUMN TWO	COLUMN THREE
Goals	**ACQUISITION OF ORGANIZED KNOWLEDGE**	**DEVELOPMENT OF INTELLECTUAL SKILLS — SKILLS OF LEARNING**	**ENLARGED UNDERSTANDING OF IDEAS AND VALUES**
	by means of	by means of	by means of
Means	**DIDACTIC INSTRUCTION, LECTURES AND RESPONSES, TEXTBOOKS, AND OTHER AIDS**	**COACHING, EXERCISES, AND SUPERVISED PRACTICE**	**MAIEUTIC OR SOCRATIC QUESTIONING AND ACTIVE PARTICIPATION**
	in three areas of subject matter	in the operations of	in the
Areas, Operations and Activities	**LANGUAGE, LITERATURE, AND THE FINE ARTS** • **MATHEMATICS AND NATURAL SCIENCE** • **HISTORY, GEOGRAPHY, AND SOCIAL STUDIES**	**READING, WRITING, SPEAKING, LISTENING** • **CALCULATING, PROBLEM-SOLVING, OBSERVING, MEASURING, ESTIMATING** • **EXERCISING CRITICAL JUDGMENT**	**DISCUSSION OF BOOKS (NOT TEXTBOOKS) AND OTHER WORKS OF ART AND INVOLVEMENT IN ARTISTIC ACTIVITIES, e.g., MUSIC, DRAMA, VISUAL ARTS**

THE THREE COLUMNS DO NOT CORRESPOND TO SEPARATE COURSES, NOR IS ONE KIND OF TEACHING AND LEARNING NECESSARILY CONFINED TO ANY ONE CLASS

— intellectual or physical — can be formed. And it only can be done with a coach with four or five trainees, not thirty or forty, at one time. You could not do this coaching in a million years with thirty students.

Now, since schools of education do not prepare our teachers to coach, and since they have classrooms and curricular arrangements in which coaching cannot be done, our children do not learn how to read, write, speak, listen, or how to do the mathematical or scientific operations well. They never will be able to do these things if they are not coached. These skills can be developed in no other way. We have to get coaching back into the skills in the schools. Coaching is ten times more important than the acquisition of organized knowledge (column 1) which most people forget anyway. I regard myself as an educated human being, and I have forgotten almost everything I learned in school as described in column 1 of the diagram. But I have not forgotten the skills I formed. They have remained with me all my life, and I have improved them. The first kind of learning is evanescent; the other two kinds are permanent.

The third column is even more important than the second. The first column is knowing *that;* the second is knowing *how;* the third is knowing *why.* The enlargement of the understanding of basic ideas and values cannot be done by didactic teaching, and it cannot be done by coaching. It must be done by discussion, by the Socratic method of asking questions in seminars that run for two hours, in which the things discussed are books, not textbooks. No one can discuss a textbook. You have to have books that are readable and discussable, that deal with ideas and values. And you have to have other works of art that enhance those values. These are almost absent from the schools today.

The great joke is that the only place in the school system where this kind of teaching and learning goes on today is kindergarten. The kindergarten teacher does sit on the floor with her students. They sit in a circle, and she tells them a story or a fable. They ask questions, and they enjoy it. That kind of teaching persists a short while in the first grade. But by the time the children get to the second grade, it stops. So what should persist through the whole twelve years is almost entirely absent in our schools.

There is an organic or biological analogue of this. For our life, for our body's health and vitality, we need three nutriments: fats, carbohydrates, and proteins; and we need them in a certain balance or proportion. One can imagine what our body would be like if we had a diet solely of fats. Well, our schooling is that kind of diet. It consists almost solely of column 1 teaching, and unassimilated at that. It is teaching and learning that is unalloyed by the "carbohydrates" and "proteins" found in the second and third columns.

The three columns are diagrammed in two dimensions as if they were separate; but all the work we have done indicates that in a properly constructed curriculum, these three kinds of learning and teaching are organically related to each other. Our teachers are totally untrained for the third kind of teaching. They may have a bit of training for the column 2 kind of teaching, coaching. They have none of the third kind, which enlarges understanding. It is only the rare gifted teacher who does it at all, and then not because of anything that he or she learned in a school or department of education.

In addition to the threefold course of study which runs through twelve years, there are three auxiliaries: twelve years of physical education; six years of manual training, including cooking, sewing, typing, machine repair — all the manual skills — not for any vocational purpose, but because learning how to do things with one's hands is just as much a matter of mental agility as learning how to do things with words; and, in the last two years, a general — I emphasize the word general — introduction to the world of work.

A comment on this last point is in order. Vocational training, as it is now conducted, is worse than useless, but it will also be terrifyingly wrong, because ten years from now, computers and robots will be doing most of the unskilled and semiskilled work. Computers will direct robots and will program other computers.

The only kind of preparation for work that makes any sense is schooling in the liberal arts, the intellectual skills, the skills of judgment, the skills that help a child to learn how to adapt to learning whatever he or she needs to learn in life. That is the only proper preparation for the world of work. It is not preparation for a particular job; that kind of training goes back to the guild system when the children of glassblowers became glassblowers, the children of metalworkers became metalworkers, and so on. It is not only undemocratic to narrow a child's future to any particular slot, it is also foolish, since most of those slots will disappear anyway.

We haven't begun to think of what is involved in preparation for work over the next ten, fifteen, or twenty years. Our country, as everyone is beginning to realize, needs radical reorganization of our industrial life. We can no longer compete in the world economy with a nineteenth-century model of industry. Those jobs are gone forever.

That is the Paideia Proposal for the kindergarten and then the next twelve years of schooling. Obviously some children will go on to advanced schooling, some to college, some to universities. But all children must be prepared to continue learning throughout their adult life, whether they go on to college or university or not.

There are implications in the proposal for our colleges and universities, which are in a bad state on both the undergraduate and graduate levels. The members of the Paideia group, many of whom are college presidents or deans, have given up on the colleges, as did Robert Hutchins fifty years ago. It took Mr. Hutchins from 1930 to 1943 to create what I would say is a general college at the University of Chicago, a college devoted entirely to general liberal learning. In 1943, we had a completely required college curriculum at the University of Chicago. That was so radical that it almost brought on a faculty revolt. Indeed, it was so radical that within twelve months of Mr. Hutchins' leaving the university to join the Ford Foundation, members of the graduate school undid the whole thing. Our colleges and universities are under the control of the graduate schools which are specialists' schools. They are not interested in general education at all. They are interested in research in their specialties.

To create a good college, Robert Hutchins made the college faculty an autonomous ruling body of the University of Chicago. This faculty was in no way responsible to the graduate school. There were appointments to the college faculty, promotions within the college faculty, salaries determined by the college faculty, curriculum developed by the college faculty, all this independent of the graduate school. In short, the college became autonomous, because that was the only way you could make a good college of the University of Chicago. But, as I say, within twelve months of Robert Hutchins' leaving, that program and setup were dismantled, and the college of the University of Chicago became like any other college anyplace else. The only college in the country that Hutchins and I had anything to do with that still persists as a college in which general liberal humanistic learning is required for four years is St. John's College at Annapolis, Maryland, and Santa Fe, New Mexico.

There are no departments at St. John's College. There are no professors. Every member of the faculty must teach the whole curriculum. That is the only way you can make it work. That is the ideal.

St. John's College has been in existence since 1937. It has never enrolled much more than 380 or 390 students. Why? Why has general education at Chicago been thrust aside; why has it been thrust aside at Harvard? Why was Hutchins' general education at Chicago undone? The answer to that is also one of the reasons for the Paideia Proposal. Today, college comes too late in a young person's life. The years of the young in college are eighteen to twenty-two. That is too close to the time when one leaves home, gets married, earns a living. Asking the young or their parents, under those circumstances, to subscribe to four years of general, unspecialized, unvocational education, an education that does not directly prepare for any profession, will, of course, be resisted and rejected. And it probably should be that way.

So we decided that if we are going to have general human learning in this country, it has to be accomplished in the first twelve years of compulsory schooling.

That program is right for another reason; namely, that that is the only schooling that is common to all children. Learning should be common to all, and it should occur in schooling that is common to all — grades kindergarten through twelve — not in college, which is for less than half the population.

Now, agreed that colleges will continue to be specialized and departmentalized, that their catalogues will continue to be crammed with elective courses — Harvard alone has four thousand courses in its catalogue! — let all that stand. The Paideia group says, if we have the *paideia* pre-college schools underneath, let's at least have some continuation of general, liberal, humanistic learning at the college level. The proposal — it is only a proposal — that I have made, at the invitation of a number of college presidents, to their faculties, is, keep your catalogue and all your elective majors, but have just one minor for all four years, something which all students will be required to take. That minor, in the form of a seminar, will consist of the reading and discussion of books and the discussion of works of art. When I propose that to college faculties, they smile indulgently, until I make the next statement, which is that this will work only if all members of the faculty lead these seminars. At that point they throw their hands up. "You can't expect us to do that. What books would you have?" I name a book. "Oh, that isn't in my field." That is the statement that ruins everything: "That book isn't in my field." Sure, the students can read it, because they do not have any fields. But the faculty cannot, because they've got fields. You cannot get a college faculty in this country to undertake such seminars with students.

Another demon we must exorcise is the Ph.D. degree. The Ph.D. degree has no ancient lineage. There were no Ph.D.'s in the medieval universities. They had only four degrees. One was the teaching degree, the master of arts. The master was strictly a teacher, and he taught the same arts that the students were to learn, the liberal arts. The other three degrees were professional in nature: doctor of law, doctor of medicine, and doctor of theology.

Eventually there grew up in the nineteenth-century German universities research in the fields of science, the humanities, philology, and history. The German universities wanted to recognize these new specializations just as law, medicine, and theology had been recognized. Again, humanities was the name for whatever was left over after you accounted for the natural and social sciences, and in Germany the humanities teachers were called the faculty of philosophy. So the degree was called "doctor of philosophy," but it had nothing at all to do with philosophy.

Today there isn't an actual doctor of *philosophy* in our country. There may be a few in the departments of philosophy, but for the most part they, too, are not philosophers. We don't refer to someone as a "doctor of philosophy"; we say "doctor of philosophy in education," or "doctor of philosophy in physics," or "doctor of philosophy in engineering," or accounting. Today you can be a doctor of philosophy in anything.

The meaning of the Ph.D. degree in the German universities was, in the beginning, acceptable, because it meant a degree that signified the accomplishment of specialized research in a given field like philology or history or mathematics. It did not mean a degree that prepared anyone to teach. It had nothing to do with teaching. The great teachers in Germany were the teachers in the humanistic gymnasium, and those were not Ph.D.'s. They shouldn't have been Ph.D.'s. At Oxford and Cambridge universities, well into this century, the highest degree, other than the professional degrees, was the master's, as it should be. Finally Oxford and Cambridge yielded. And, of course, the American universities slavishly imitated the Germans, but with a difference. The American universities came to regard the Ph.D. degree as a certificate for a teacher. That is why our college faculties are staffed today with Ph.D.'s. One of the great letters in all of American literature is William James' letter to the president of Bryn Mawr College who had refused to hire James' best student to teach philosophy because the student did not have a Ph.D. James' letter became the classic little essay entitled "The Ph.D. Octopus."

We ought to restructure the whole thing. We ought to have a "Sc.D." which would stand for doctor of science, and doctor of scholarship, and use that in place of the Ph.D., for all graduate degrees other than law, medicine, and theology, which are research degrees. The Sc.D. would not signify a teacher at all. If we want to signify someone who is prepared to teach, and since the master of arts degree no longer means that, let us resuscitate the old degree (now an honorary degree) of L.H.D., doctor of humane letters. That would be for the teacher of general, liberal, humanistic studies.

Then let us require — for the sake of our culture, if nothing else — that all Sc.D.'s and all L.H.D.'s should also be Ph.D.'s in the proper meaning of Ph.D., that is, doctors of philosophy, meaning that they must have some acquaintance with the fundamental ideas and values of our civilization. Let them be philosophical experts and philosophical teachers in the sense in which both John Stuart Mill in his famous address as rector of St. Andrew's and Cardinal Newman in his *Idea of a University* meant philosophy, not in its narrow sense as in our philosophy departments today, but in its general sense.

What we are saying is that everyone should be a generalist first and a specialist second.

Robert Hutchins never tired of saying that the university should be a community of learning, a community of scholars. But how can we say a university is a community when students and teachers have nothing in common? You can go to every college in the country at graduation time and ask this question of the seniors: What one book have all of you read in the last four years and discussed with one another? To which there would be no answer at all. No answer, not even in the Catholic colleges. All may have read certain textbooks, but not one book. So it is ridiculous to think of the university as an intellectual community today.

This is a serious matter that goes beyond the education of the young, if it continues. The man who called the shots on that is José Ortega y Gasset. I recommend to you, as *the* most important educational document in the twentieth century, his *Revolt of the Masses*, particularly chapter 12, "The Barbarism of Specialization." That was written in 1930. What Ortega describes there is true to a much more intense degree today.

The ideal of a truly educated human being, something to which every child has a natural right to aspire, is in some degree attainable only at the end of life, in the ripeness of maturity, certainly not much before one reaches the age of fifty or sixty. There is such a thing as terminal schooling. But education is for a lifetime. We can give certificates, diplomas, and degrees to signify the completion of schooling. The only thing that signifies the completion of education is a death certificate.

Discussion

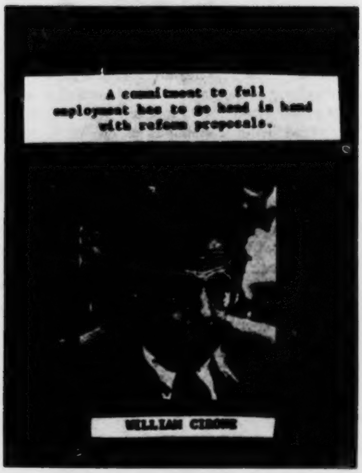
DONALD McDONALD *(Editor of The Center Magazine)*: One has seriously to question how committed the American people are to improving the quality of public education. How committed are we to putting our money where our alleged interest is with respect to quality education? *The New York Times* recently published a series of articles on basic education, and one of the shocking facts that came to light was that the salary of beginning teachers with a bachelor's degree in New York State is roughly $12,500, whereas beginning engineers, beginning computer programmers, beginning specialists in the sciences, receive about twice that figure as a starting salary. What does that mean? To me it means that American public opinion either isn't aware of how much quality education costs, or it is aware but thinks the price is too high. I am not saying that the only or principal problem in education is the salary scale of our teachers. But it is asking an awful lot of today's brightest, most perceptive college graduates to commit themselves to teaching careers when their beginning salary is half what they could get by choosing a career in business or industry.

ADLER: A full year before that very poor report came out from the National Commission on Excellence in Education — a shamefully poor report, by the way; one totally inadequate in its recommendations, and telling us nothing new — *The Paideia Proposal* recommended, as did the Commission, an absolute increase in teachers' salaries. That has to be done for the reason you mentioned. The college population that is now going into teaching is a scraping of the bottom of the barrel as far as human potential is concerned.

But there is one thing more important than money. We are the only country in the world that does not respect teachers. In every European country and in Japan, members of the teaching profession have the same social status and public dignity that physicians, lawyers, engineers, and ministers have. That is not true in this country, and I don't understand why. I have never found any sociological explanation of the low estate in which teaching is held. In my judgment, teaching may be the highest of the learned professions. St. Augustine said that teaching is the greatest act of charity. Raising salaries alone will not do it. The teacher has to be recognized in the community as one of its most important professionals. How to bring about that change, I don't know.

ROSEMARY PARK *(Former President, Barnard College)*: Does that have anything to do with the kind of training which teachers receive in other countries? I am thinking, for example, of what the German *Gymnasiallehrer* would have received.

ADLER: I think so. There is no question that our schools of education have miserably shortchanged our teachers educationally. Most of our teachers are not educated persons. Most do not even have a love of learning. I will put it harshly: the teacher who is teaching only because that is the only way he or she can earn a living is no teacher. A true professional is not a money-maker. One must make money. One must receive respect for one's abilities and deserve fitting compensation. But the true professional works because of the end being served. A person who is truly a teacher will teach regardless of his income. That is not the case in the United States. It is more true in Japan and in Europe where the teachers, as you say, are much better educated and are seen by the public to be so.


A commitment to full employment has to go hand in hand with reform proposals.
WILLIAM CIRONE

WILLIAM J. CIRONE *(Superintendent of Schools, Santa Barbara County)*: One of the important considerations pointed out in your book is the need for a commitment by this country to full employment. That has to go hand in hand with the reform proposals you are talking about. But you really did not address that issue in terms of the viability of your over-all proposal.

ADLER: That is a most difficult commitment for the nation to make in view of the technological changes that are on us. That is why I said that if we stick to the present kind of vocational training we are giving in our schools, we will never have full employment again. We will have a permanently unemployed class because the jobs will not be there. So, we can understand why underprivileged minorities, particularly in our schools in the ghettos, where the unemployment rate is so vastly higher than in the more privileged groups in our population, are not motivated to learn. They see themselves being thrown on the junk heap at the end of twelve years of schooling.

But my colleagues and I are persuaded that the success of the Paideia Proposal depends on its beginning in kindergarten. There is a great deal of talk in the country about the need to reform our high schools. No reform of the high schools that is worth anything will be possible without going back to the kindergarten and first grade. If the first eight years of school continue to be as bad as they are now, you will not be able to do anything about improving the high school. You can't even do anything in the sixth grade if you haven't already made the necessary changes in the first five years of school.

If you start doing what is required in the kindergarten, and keep on doing it, you will not have any problems of motivation. There is no question that one of the great innate gifts of every human being is the love of learning and the desire to learn. There are teachers who have demonstrated that they can teach mathematics and reading to children before they are two years old. That's easy to do. It is not easy to do when the children are eight or nine years old and have already been turned off by the bad schooling they have received. By the time those children get to high school it is impossible to motivate them. The whole point is that one must start educational reform in kindergarten and go up. We can't hope to do things better at the top and think they will be supported by the bottom.

GAYLE BINION *(Senior Fellow of the Center for the Study of Democratic Institutions)*: Aren't you talking about a system that has an equality of results, rather than just an equality of the educational process, because you do talk about the need for remedial work for some? Isn't this broader than remedial work? If so, what you need to do is convince the policy-makers that they must meet the educational needs of all students equally, not that there has to be equal funding for all or the same educational process for all. Is your goal an equal product at the end of the schooling, regardless of the funding and methods?

ADLER: I am glad you used the term "equality of results," because we do not think an equality of results is possible. We are absolutely for equality of schooling, which means the same educational objectives for all, and that all students should be exposed to the same quality of instruction. But we recognize there are individual differences in students.

The children come to us like so many different-sized containers, half-pint containers, pint containers, quart containers, gallon containers, jeroboams, and on up. Now, you treat all these children equally in two ways. First, each container should be filled. Obviously, you cannot put more than a half-pint of filling into a half-pint container, but a half-pint container that is full to the brim is as full as a quart container or a gallon container full to the brim. I am using containers to indicate capacity or innate endowment. All the containers, of whatever capacity, should be full.

Second, the filling should be the same for all. If thick cream is the substance of good schooling, then all the containers should be filled with thick cream. There should be a half-pint of cream in the half-pint container, a quart of cream in the quart container, and so on. You can't get a quart of cream in a half-pint container, so you cannot get equality of result in that sense. But if all students have cream up to the brim, they have all been treated absolutely equally in the light of their individual differences.

If all men were equal in all respects, we would not have this problem. But we are equal only in our common humanity. We are unequal in all the degrees of our aptitudes within that common humanity. So the term "equality of results" is misleading. All students will take mathematics through calculus, but they will not all be equally proficient in calculus. All, according to our curriculum proposal, would take the natural sciences through physics, but they will not all be equally proficient in physics. That is because of their innate differences. But all will be exposed to the same kind of learning. All will be filled with thick cream to the brim.

JOYCE FADEM *(Political Affairs Director, California Teachers Association)*: In your chapter on overcoming initial impediments, you do not deal with such impediments as poor housing conditions and poor economic conditions in the very communities that we are going to rely on to help overcome the educational deficiencies. How can you get these communities to recognize the need for reform and also pay for the special preschool programs you are talking about?

ADLER: Let me first say how that is being done in France, a country that is five years ahead of us on the Paideia Proposal. Before 1977, the French system of schooling was the most elitist in the world. It was excellent schooling, but only for the few. In 1977, the French Parliament passed an education act calling — as the Paideia group has done — for the same quality of schooling for all children. Then the Parliament faced the problem you raise. Some children came from disadvantaged homes, some children came with less aptitude. The French use the word remedial in a different sense than we do. We use it to mean making up for bad teaching or bad learning in the early years. The French use the term remedial to mean supplementary education

How can economically depressed communities pay for the special preschool programs?

JOYCE FADEM

rather than remedial. They said, some children need preschool teaching for two or three years before they come to school.

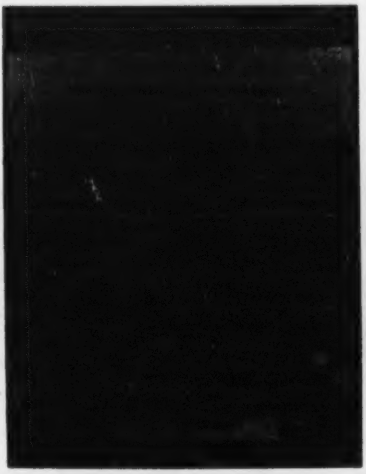
The one commitment in this whole Paideia program that I had to forego because I had resolved never to put anything into the book (which everyone was signing) that everyone did not agree to. I could not get my colleagues to agree to what I wanted to say on this point. I wanted schooling to start at age four, not age six. I think it is a great waste to start at six. Also the earlier you start schooling, the more you take care of the "bad home" impediment. Plato thought one should take children from the home right at birth and put them in the common school.

But if you cannot begin schooling by age four, you can certainly have all kinds of "head start" programs and preschooling to make up for environmental and domestic infelicities.

We definitely favor ability grouping, not age grouping, in classes, particularly in subjects like mathematics, the sciences, and the skills. The one place where you want age grouping is in studies that enlarge understanding. Age does make a difference in the discussion of ideas and values. Where children are lagging behind, we want to give them some kind of instruction to keep them abreast. We want no one to fall behind that minimum. Now, if that comes down to one-on-one instruction, we have to do that, too.

We have been asked, again and again, won't this kind of education be outrageously expensive? The answer is, no. It will be less expensive than the present school system is. Think of the expenses you will eliminate: all vocational instruction and all the electives which are so wasteful and expensive. A word on the technological future in this area. Tutoring or coaching requires, ideally, an individual, one-on-one relation between teacher and student. At the most, five or six persons can be coached at one time. But computers are ideal coaches, particularly in skills. Computers can coach all the skills — reading, writing, speaking, listening; and all the mathematical skills. In the future, every child will have his own mechanical coach, or computer, and can learn at his own rate without fear of embarrassment for not keeping up with his classmates. So, the real hope here is the mechanical coach, the computer, in place of teachers, for the development of intellectual skills.

And the teaching in column 1 of our diagram — teaching by lecturing, or teaching by telling — can also be done far more inexpensively and competently than it is now. Take American history. There are in the United States five or six absolutely superb lecturers, maybe, at most, a dozen such lecturers, in every phase of American history. Why have the classroom teacher who is a poor lecturer do that? Why not put those superb lecturers on video tape and pipe their lectures into the classroom on closed-circuit television? The classroom teacher can be present as an older student, studying what's being said and, along with the students, reacting to it through discussions.



In other words, the more that teaching is reserved for the third column, and the more you use the technological means to do the teaching in the first and second columns, the better we will be able to afford these reforms and the better the teaching itself will be.

DAVID THOMAS *(Superintendent, Santa Barbara Schools)*: What do we do about tomorrow? That is a practical question. We now have two years of required social studies and four years of required English in high school. There has been a lot of opposition to that as I have introduced it over the last four or five years in my capacity as superintendent. Since we raised the standards in our school district, we have had a dropout rate of about ten per cent. Before we raised the standard, we had a five-per-cent dropout rate. I have here two different economics textbooks for twelfth-grade students. One treats the subject with a great deal more sophistication than the other. Now, is this an adequate way to deal with the differences of ability that we find in our students? Or do you find this dual approach to subject matter to be part of the problem, rather than part of the solution?

ADLER: It's part of the problem.

THOMAS: How would you deal with the fact that you have advanced-placement-level students and also students who are barely dragging through the school system?

ADLER: Let me go back a minute. You mentioned the word "English." There's no more mind-benumbing educational term than "English teacher." It's a crazy notion. Many years ago I, along with I. A. Richards, was invited to address the National Council of Teachers of English. Mr. Richards, who is perhaps most noted for his book in 1923 with C. K. Ogden, *The Meaning of Meaning*, had developed a system of basic English, consisting of just 850 words. So I gave an address entitled "What Is Basic About English?" I advocated the abolition of all English departments, because that department is merely the tail end of the liberal arts. The only real English teacher is the person who teaches English as a second language. Literature is another matter. The study of language is another matter. None of the studies in the second column of our diagram are English. All those studies are intellectual skills. The whole notion of an English department throws the school system out of focus.

A second point: there is no economics course in our curriculum. The three basic subject matters are geography, history, and the study of social institutions. Insofar as corporations and businesses are social institutions, there would be some study of those. But I doubt the validity of those textbooks for high-school instruction. Also, there would be no electives in the high-school curriculum.

You ask, where do you begin tomorrow? If you ask, instead, what is the first step to bring about a *paideia* school, my answer is, you begin with the kindergarten. You do not begin in the high school. The first step is to introduce in kindergarten and in all twelve grades what is not there now. And what is not there now is column 3, the enlargement of the understanding of ideas and values.

Having done that, the next step is to improve greatly what is so deficient now, namely, the coaching of the skills, our column 2. I would be quite content to leave column 1 untouched for quite a while. If you introduce column 3 first, and then go to column 2, that in itself will change what happens in column 1.

THOMAS: You use the word "objectives" in your book. You say, we will have the same objectives for all students. Maybe these economics books are not the right ones. But we are looking at the way the American economic system functions, because that is an element within our society. We feel that the student should learn that and that all 1,500 seniors now enrolled in our three high schools should learn it. Now, if you decide that that is an objective — whether it's a small part of a larger course or a semester course all by itself as we are now requiring it — should we differentiate the materials that the students use according to their capacities?

I can ask the same question with regard to kindergarten. Some children arrive in our kindergarten with a vocabulary of fifty words. Other children arrive in our kindergarten with a vocabulary of two thousand words. At that point, we begin the differentiation process. For those who have only fifty words, we begin an oral language development program, because you can't read until you can talk. Those who have an adequate vocabulary we proceed to teach some of the phonics to begin reading.

That differentiation process begins in the kindergarten. I submit that we have no choice in that regard. That is the question I am asking you. How do we deal with that necessary differentiation process? We have seniors who are going on to Stanford and Harvard. We have seniors who are barely squeaking through. At both ends of the schooling continuum, there has to be a significant differentiation process. I am sympathetic to your proposal, but I am trying to understand how to deal with it in the real world.

ADLER: There should be no differentiation in objectives for the college-bound and for those who are ot college-bound. Obviously the degree of learning ill be higher for some. The point I made about bility grouping fits your point. You have to take e child as he comes to school. The child who omes to school with that very small vocabulary eeds preschool teaching. We try desperately hard nd don't succeed in overcoming the deficiencies f those who come unprepared for school. That ertainly is required. We have to go back before hat sixth year, or even that kindergarten year, to ee that they do not come to school so unprepared.

HOMAS: When those two children come in, one with fifty-word vocabulary and one with a two-housand-word vocabulary, the processes that rought those children to us with that differentiation will accelerate that difference, not decrease it, s time goes on.

DLER: The aim is to decrease it.

HOMAS: You cannot.

ADLER: Why can't you?

THOMAS: First, because we have the children in school for only a modest amount of time. The school's influences on the children are quite modest compared to the influences of other forces in society. My son, who is a fourth-grader, was having fun recently with a book that talked about "fodder" as the male parent, and "intense" as where Boy Scouts sleep. Those are the kinds of things he thinks are funny. But there are other children who still do not understand basic number concepts. What I am saying is that differential influences in the home will continue to accelerate until these children get to my twelfth-grade program, and we simply cannot teach all twelfth-graders — whatever it is we choose to teach them — out of the same book, whether it is a textbook or one of the great books.

ADLER: I have no answer to this, except to repeat that the reform has to start earlier and has to continue all the way through. I don't think you can do it now. You are caught in a trap, and you can't get out of it. I am talking about the future. I said that this may take thirty, forty, or fifty years to do. I am not saying you can do this tomorrow. Even if you had the best will in the world, even if you subscribed to everything we said in *The Paideia Proposal*, you couldn't do it. You can make a dent in this, but you can't do much more than that.

This reform will happen only if a lot of small dents are made, and a lot of small steps taken. You cannot produce this revolution by fiat or any other way. You are up against circumstances that impede you from doing it. You have described them. I am telling you what must be done. Those children must not come to school that way. They are not born that way, I assure you. They have been disadvantaged by all kinds of horrible circumstances. Let me put it more generally: the kind of educational revolution we are talking about calls for a social and economic revolution as well. You will not get the former without the latter.

THOMAS: Let me give you the best example of the revolution that we require. We have seriously emotionally disturbed elementary children in our special education program. One of these children cut off his mother's hands. Another one thinks he is Moses. We have them in a two-to-one child-adult ratio. I asked the two people who supervise that program what the turnaround rate was. They said that within a year and a half about half of these children have developed enough ego strength to function in the same home environment that produced the original distortion. What happened is that those children were in contact with some intelligent, competent, caring teachers. I submit that the revolution that ought to take place — and it's a bit too close to 1984 to be suggesting this — is that we ought to take children away from home environments that create that kind of brutality.

ADLER: Ruth Love, who is General Superintendent of Schools in Chicago, has an ideal for Chicago. It is a boarding school for the underprivileged. She wants to have these children out of the home. She wants to take them very early into a good boarding school. That is one answer to your question. As I said before, Plato, in the fifth century B.C., thought that the training of the future guardians of the state required that the children be taken from their parents at birth and put in a public household. He saw no other way to give them equal training.

IDA RICKBORN *(Principal, El Rancho School, Goleta, California):* I am interested in the idea of two to three years of preschool to make up for some of the inequalities from homes. On the other hand, we cannot take children away from their homes and still call this a democracy.

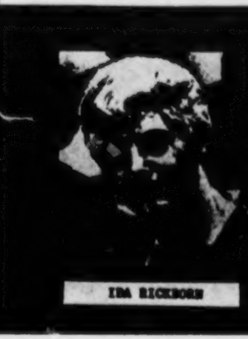
ADLER: That's right.

RICKBORN: So what do we do?

ADLER: Make it voluntary. I assure you that if Ruth Love could get the money to create a boarding school in Chicago for the children she has in mind, the parents would be willing to send them.

RICKBORN: Those children are the ones who really come from the more advantaged homes. The children we are talking about are those who are difficult to reach.

We cannot take children
away from their disadvantaged homes
and still call this a democracy



IDA RICKBORN

ADLER: I agree. There are evils in our society that no reform of the school system will cure. Those evils are the antagonistic forces we have to live with. One shouldn't be a dewy-eyed idealist and not face the facts of life. But that should not stop us from making every effort to move in the right direction. All I am saying is that this will come about if everyone makes a concerted effort to take whatever step he can take away from what is going on now. What is going on now is wrong. Our kind of society will not survive either economically or politically with the school system we now have. If we keep that kind of school system, we ought to give democracy up tomorrow.

CIRONE: I am not so sure that the first reform step is to introduce column 3 into all grades. This deals more with the philosophical commitment that you state at the very beginning in your manifesto, which is that all children are educable. If we acknowledge the differences of ability in children, then, more often than not, we end up in a system of tracking. That very tracking increases the separation and the divisions between children and ends up in a ten-per-cent drop-out rate. We are educating one portion of our student population better than the national average, but at the same time we are failing to a much larger extent than we have ever failed before with regard to many of the other children.

ADLER: We certainly are resolutely opposed to all tracking. At the same time, we cannot ignore the fact of individual differences, not only in native endowment, but also in the relative advantages or disadvantages with which the child grows up. We have to face that. But equality is both absolute and proportional. The kind of equality we are talking about is proportional equality. Nothing else is possible.

SIMON: I have no difficulty seeing the half-pint and jeroboam metaphor as reflecting some sense of equality. I do not say all children must turn out identical. The question is whether it will require not only unequal resources to meet those educational needs equally, but also a different method of education. Why do you assume that the same type of education in the same manner is necessarily going to work equally well to fill both the half-pint and the jeroboam?

ADLER: What we have talked about in *The Paideia Proposal* is the kind of learning that should be the common possession of all human beings. It is human learning. Everything else is secondary, specialized, and, in particular, individualized.

To put it another way, not everyone should be a carpenter, not everyone should be a scientist or a mathematician. But everyone should be, shall I say, in possession of a certain amount of knowledge about he world in which he lives, have all the skills of :arning which are the intellectual skills, and have ome understanding of basic ideas and values. We ay everyone should have those.

That should come first. That is general. The coleges and universities can be specialized, and then ıll those individual differences can be treated later.

People say, but if you have the same required rogram for all, won't it be like turning out so nany cookies with a cookie punch? That is absurd. have taught in colleges, both in the University of Chicago and St. John's College, where they have :ompletely required programs. The individual differences are not suppressed. Give the same material o different students and they will react differently. n fact, far from being suppressed, individual differences are accentuated by the same kind of curiculum. But what happens now with all the electives and so forth in all our colleges and universities s that there is no commonality left at all.

Also, though the content of the curriculum and he objectives of the curriculum will be the same, he teacher should be sensitive to individual differ:nces in the students. If a teacher taught five different children in a one-on-one relationship, that eacher would teach each of those five differently, ecause they are different. The trouble is, of course, hat one teacher has to teach fifteen or twenty or wenty-five students.

I have taught seminars in high school for the ast two or three years, and I have had no difficulty n discussing any book or any piece of reading maerial with a group of normal high-school students, ıll of whom are different. You learn to handle their lifferent reactions in the course of the discussion. io there is no problem of individual differences vhen teaching the enlargement of an understandng of ideas and values.

It is when you come to teaching intellectual skills hat the individual differences become most proounced. There I would almost like to have the ndividual student coached with a mechanical de'ice. In column 1, there is no problem at all, be:ause a thousand students can listen to a lecture as well as ten. The lecturer never thinks of the individual differences in an audience. If he does, he is not good lecturer. The good lecturer thinks of his earers as being human beings.

ARK: Is there any disposition on the part of the 'aideia group to examine the whole spectrum, :indergarten through B.A., to discover at what times in the chronological development of the child one best teaches different kinds of material? For example, when is it best to teach foreign languages? Do we waste time trying to do that in high school? Could we do it better in elementary school? On the basis of research in this matter, I am not sure how far along we are. Some psychologists tell me that we are not far enough along to structure properly a curriculum on that basis. We may know some things that it would be wise to incorporate in your column 1.

Do we know enough about the chronological development of the child to tell when it is best to teach different subjects?

ROSEMARY PARK

ADLER: We definitely recommend the acquirement of a second language in the elementary grades, not in high school. Now, if you could start schooling at age four, and give the baccalaureate as the high-school diploma, then my second recommendation — also not adopted by my colleagues and so not included in the book — is compulsory non-schooling between ages sixteen and eighteen. At sixteen, everyone should get out of school to grow up on the job in the public or the private sector. After that they would be good college students.

I taught at the University of Chicago when the first ex-GIs came back after World War II. I had in the same classroom the ex-GI students and the ordinary students. The difference was as between day and night. The ex-GIs were mature. Their interest in learning was different. You couldn't teach them the same way. I am convinced that being out of school for two years would be very good. Of course, there would be problems with labor unions, and my colleagues in the Paideia group said, don't take that on. So we didn't put that in the book.

PARK: There may be a time when one can do mathematics better, and a time when one can do history better. But we pay no attention to that. What is the level of research on that at this moment? Is it true that these periods are definable?

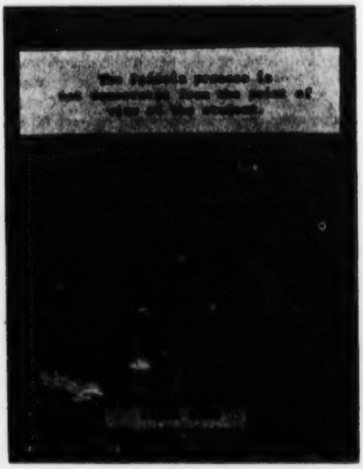
HERBERT RAVETCH *(President, Pierce College, Woodland Hills, California)*: The California Post-Secondary Education Commission recently published a study of remedial education in the University of California, in the state universities, and in the community colleges. In the University of California, fifteen per cent of all English and reading courses are remedial, and cost over six million dollars. In the community colleges, more than forty-five per cent of all English courses are remedial, and fifty-seven per cent of all mathematics courses are remedial, at a cost of sixty-six million dollars a year.

I am convinced that the pre-kindergarten period — the first five years of life — is the key to everything we are talking about. We can work with the mainstream children. But when we deal with the children from the lower socioeconomic areas of our society, our minority groups, we encounter serious deficiencies. We have already accepted in our society the principle of government intervention when there is physical abuse in a family. Can we reach the point where we will accept government intervention when there is educational neglect in the family? Can we do that and still maintain our democratic way of life?

ADLER: In his essay, "Representative Government," John Stuart Mill argues for compulsory education, although one would think Mill would say that was something better left to the individual, because he believes that government should step in only in matters in which what the individual does seriously affects the common good. But Mill says education is not a private matter. He says that everyone is affected by education. By Mill's principles, I see no reason why the state should not intervene in cases of educational neglect as well as physical abuse. Would that be undemocratic? Anything for the common good that is decided by the people is not undemocratic. It is what democracy should do. If intervention is for the common good, let's do it. All our studies show that the child who enters school under adverse conditions is behind the eight ball for almost all the rest of his schooling. That is very hard to overcome.

LINDA BOND *(Senior Consultant to the State Senate Education Committee, Sacramento, California)*: Your proposal tends to equate quality with sameness, and you have touched on that. All students under your proposal would take the same course of studies, save for their choice of a foreign language. Why not also allow some student choice among quality alternatives that support your general objectives?

ADLER: Because we cannot think of what those alternatives might be. At present, the elective system allows students to give themselves no education at all. They can take snap courses. That must be eliminated. Look at our suggested program. What would the alternatives be? Column 1 deals with all the subject matters you can learn. Column 2 deals with all the intellectual skills. Column 3 deals with basic ideas and values. What is left out? What would the choices be other than a second language? We are talking about basic schooling. Colleges and universities are something else.



The Paideia process is not democratic from the point of view of the student.

BOND: The trouble is that some students will not go beyond high school, and we know that process, as well as content, teaches. What we have here in *The Paideia Proposal* is a goal to support a democratic society, but a process that is not democratic from the point of view of the student. The student has no opportunity to choose among alternatives.

ADLER: A required curriculum is not an invasion of freedom. When you go to the doctor's office, you are not free to choose the pills the doctor gives you. The notion in the nineteen-sixties that the students should be consulted about everything in order to make the schools democratic is utterly absurd. They should not be consulted about anything. They are too young to be consulted. They do not know enough to make free choices of that kind. There is nothing undemocratic about a required curriculum. And no invasion of freedom is involved.

The point that is absolutely indispensable here is that the completion of basic schooling is not the completion of education. It is the bare beginning of education. Whether they go on to college or not makes little difference on this particular point. If students do not continue to learn in adult life, they might just as well not have gone to school at all.

BOND: I do not want to argue this from the point of view of the sixties. We have to move well beyond that. But to allow no student a choice based on his or her interest, say in art —

ADLER: That is extracurricular. I realize there are children who would like to become ballet dancers, or piano players, and so forth. All those activities can be extracurricular.

BOND: That involves critical questions of cost.

ADLER: I don't think so. As I said, this proposal, if adopted, would cut educational costs considerably. I am all for extracurricular activity: the school paper, student government, theater, art, dance. I should point out that the Paideia program does not accommodate geniuses. The kind of extraordinary talent that makes a young person prepare for the ballet or to play the violin in concert performances at the age of six, cannot be handled in our program. You cannot devise a program for that kind of extraordinary genius. The genius bent may sacrifice the rounded person. It may mean overdevelopment of one talent at the expense of a generally rounded human being. The Paideia program is not intended to handle the person who is so bent on one particular activity — ballet, music, painting, or anything else — that not even extracurricular activities will meet his needs. But for the other children, extracurricular activities will take care of that.

BOND: Nor does your program accommodate someone who is more interested in history than in math-

ematics. That is not to say that that individual should not be exposed to mathematics at a certain level.

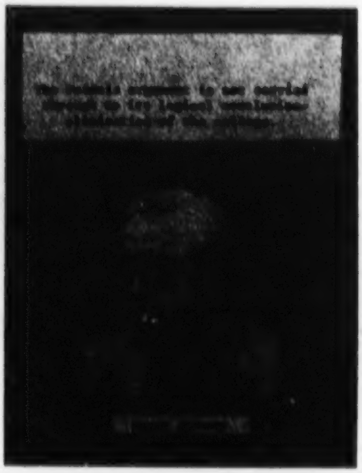
ADLER: It should not accommodate that kind of difference. Indeed, the school should work against adapting a program for the child who says, I can do this subject well, but I can't do that.

BOND: I am talking about interest, not aptitude.

ADLER: The different degrees of interest in the content of this curriculum should not be relevant.

GEORGE DAVID KIEFFER *(Chairman, Board of Directors, the Center for the Study of Democratic Institutions; Attorney-at-Law, Los Angeles; Member, Governing Board, California Community Colleges):* Is it your biggest fear, Ms. Bond, that if the student is not allowed to cultivate special interests, he will somehow be turned off the learning process?

BOND: That is one fear I have. I know Mr. Adler's book concludes that, to a large degree, we have won the quantitative battle; that is, we have students for a total of twelve years now. But it is also true that in California, the dropout rate is more than twenty per cent. Two kinds of students drop out. Some are very bright, but bored, and that includes youngsters who do not feel that their individual differences are being addressed. Other students just do not have the proper foundation. *The Paideia Proposal* creatively addresses the latter students. But it does not address the first group.



ADLER: If you took children at the kindergarten level, they would not have these prepossessing professional interests when they get beyond the sixth grade. Those children are bored with a program that, for the most part, does not challenge them at all. If this program were put into effect, properly administered, and properly taught, you would have a zero dropout rate. There would be no dropouts. Dropouts — leaving aside those due to economic reasons — are caused by circumstances that are part and parcel of the over-all dismal failure of our schools.

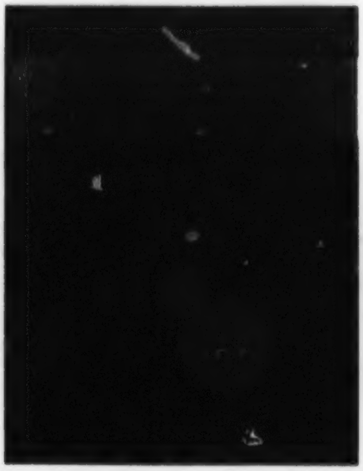
FRANK L. KEEGAN *(Writer and lecturer; former college president)*: Why don't you simply eliminate the college from your proposal? Everything else in your book says that the final formal schooling experience for all American citizens is kindergarten through twelfth grade. So what is the need for a college education? Robert Hutchins, from 1936 on, was very clear about the relationship of schooling or common education to, on the one hand, the professions and professional schools, and, on the other, to lifelong adult learning. If, after proper schooling from kindergarten through grade twelve, one can think for oneself, why does one need college?

ADLER: We've eliminated in basic schooling all forms of specialization, including all forms of preprofessional specialization. If you look into our community colleges, you will find that they provide for some degrees of specialization. I would keep those, because in the transitional stages of our economy, there is still need for some specialized vocational preparation. In addition, I would do what Hutchins wanted, give the B.A. at the end of the twelve years, and then make college the place where master's and doctor's degrees could be earned. I would agree with you that if the B.A. were given at the end of twelve years, general humanistic learning would continue and deepen thereafter.

KEEGAN: I don't think we can dismantle the community colleges, which, incidentally, also offer academic courses. But the Paideia argument is not carried through to its logical conclusion. If you were to make the argument for the final schooling phase of education for all American citizens, and then deal with preparation for professional work as a separate entity, you would add a lot of strength to your argument. You want to reform higher education. Why don't you really reform it and say that after grade twelve, if you want a finishing school, you can go to a private one; if you want to become a theologian, a lawyer, a doctor, a teacher, you can go to a seminary, a law school, a medical school, or a teachers college? That's fine. That would really change the whole notion of free public education, and that's what I thought you wanted to do. I just wish you had taken that last step.

DAVID SAVAGE *(Education writer, Los Angeles Times)*: You acknowledge that some kids are pints and some are quarts, but you do not acknowledge that there can be a two-track system. I am not convinced we have gotten anywhere in the discussion of equality of treatment.

ADLER: There cannot be a two-track approach to education. What is common to all human beings is much more fundamental and much more important than their differences. When Jefferson said all men are created equal, he meant equal in only one respect, in their common humanity. In every other respect, individuals are unequal. Equal means that no one is more or less human than anyone else. And that means that all persons have exactly the same powers, abilities, tendencies, properties, although these differ, of course, in degree. Our emphasis in *The Paideia Proposal* is on the same, but we do devote a chapter to accommodating the same to the different.



SUE EHRLICH *(Member, Board of Education, Goleta Union School District, Goleta, California)*: Equality is at the heart of the intent in your proposal, and it is also the force that will most impede implementing the proposal. You emphasize sameness, rather than difference. We must also address the notion of competition in our society. What moves education or any field toward specialization is the desire to compete. To get a jump on someone else, we specialize. Perhaps underlying competition is our inability to value ourselves enough as individuals. So we value ourselves more by valuing someone else's knowledge or skills less. It might be easier to implement your proposal if you deal with one of the tensions that will tend to negate it.

ADLER: I don't think that's so. Our failure is a failure to appreciate our humanity, not our individuality. We are overcome by our individuality. We ought to get rid of that. We ought to understand ourselves as human beings. We fail to understand what our human character is, what the good life of a human being is. Happiness is the same for all human beings. Our powers are the same. Our needs are the same. The overemphasis in the nineteenth and twentieth centuries on individual differences is absurd. If we were really concerned about our common humanity, I do not think that we would be so competitive.

There is no competition in the pursuit of happiness. If there were competition and conflict in the pursuit of happiness, no government could follow the Declaration of Independence and ensure the right of every member of the society to pursue happiness. The pursuit of happiness, the making of a good human life for ourselves, is cooperative, not competitive. It is the making of money and the getting of power that is competitive, and those are not the main things in life.

KIEFFER: You are talking, of course, about changing the entire curriculum of our schools. That makes it a very difficult proposal to understand, let alone accept. But, in simplest terms, I believe we are talking about tracking versus the best education for all. The current system starts tracking children at the earliest years and continues throughout all levels of education. The Paideia message — and generally I agree with it — is that an educational system which does not aim for the best education for all students is a system which gives up on many students before they even begin their schooling of our children.

ADLER: If I wanted to be really radical, I would say our kind of society should have no private schools at all. Why do we have private schools? It is largely because people who can afford it can get better schools for their children. If the public schools were good enough, there would be no need for private schools, and they should be abolished. The British system preserves the class structure, and you will never get rid of that structure in Britain. If we are going to have a democratic society, we will have to get rid of private schools. Now that would be a radical proposal.

KIEFFER: Every system — including our educational system — by its nature deteriorates in some fashion after a period of time. It may become bureaucratic or authoritarian or soft or simply unguided by any mission. What is then required is a revolution in thinking or at least serious reform. The great value of the private school is that it provides a vehicle for the reform that would otherwise be prevented by the established system. In the long run, the private school can enhance the continuing viability of the public school system and thereby contribute to a democratic society. □

The Potential and Real Achievement of U.S. Students in School Reading

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"I write; let others learn to read."—Joseph Conrad

If one reads the popular writers on reading achievement and literacy in the United States, one quickly becomes aware of a series of paradoxes. Some writers will claim that there is a high degree of illiteracy among the student and adult population; others will claim almost universal literacy (Harste and Mickulecky 1984). The U.S. population as a whole is one of the highest consumers of print in the world, and book, magazine, and newspaper circulations are high (Guthrie 1981). On the other hand, the National Assessment of Educational Progress (1981*a*, 1981*b*) and some other surveys of literacy (e.g., Hunter and Harman 1979) cite appalling statistics. One of the reasons for this confusion lies in the definitions of literacy currently in use. Literacy has been variously defined as being able to read one's name, being able to read the Constitution aloud, being able to answer quite complex questions about an installment loan policy, and being able to read a philosophical novel.

Another source of confusion is the apparent failure to distinguish between reading as an activity that takes place in the home or the work site and reading as a school activity (see Shultz, Florio, and Erickson 1982). In this paper, I shall focus my attention on the latter. To make clear the distinction, an individual outside of school may purchase or borrow a novel, read it, and put it down or perhaps recommend it to a friend, saying something like, "You ought to read this; it is good." In school that statement would not be accepted as proof that the individual had read and understood the novel. Reading the novel in school involves a series of complex activities before, during, and after the reading to demonstrate something called comprehension or appreciation or understanding. The individual must be prepared

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to answer oral or written questions about the content, structure, or implications of the text, must be prepared to produce oral, dramatic, or cinematic reenactment of the text. In school, the student must also be prepared to read different types of text on demand, shift subject matter and style every 45 minutes or so, have the reading interrupted, and particularly read texts that deal with subjects of little interest written in styles that may be opaque or downright incomprehensible. I remember observing a class of high-school sophomores and being told that two girls "couldn't read." The class was dealing with contemporary poetry; the two girls sat in the back reading a magazine about film stars and discussing an article intelligently. They could read, but they could not or would not do school reading.

Like many other activities that occur in school, school reading has come to be a complex domain more or less related to the broader domain. The reason for this situation lies in part in schools having a special life of their own. Why and whether this should be so remains outside the scope of this paper. I shall, however, seek to define the domain of school reading and then say something about what we know of the achievement of U.S. students in relation to this domain.

The Domain of School Reading

School reading, like many other school subjects, is an activity. As Leont'ev (1973), citing Galperin, has explained, an "activity" has an independent goal of which the subject is consciously aware. Leont'ev goes on to claim that an activity comprises "acts," which usually begin as separate activities. Acts comprise "operations" about which the subject is not necessarily conscious. To take a simple example from reading instruction, for the young child decoding is an activity. Later, it becomes an act and then an operation. Even for the expert, interpreting a poem probably remains an activity. Leont'ev describes a "skill" as the ability to perform an act optimally and a "habit" the ability to perform

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an operation optimally. To these categories, I would add the term "preference" or "style" as referring to those acts or activities that the subject selects from a range of possible acts or activities.

The domain of school reading may be defined as an activity involving a number of discrete acts and preferences (see fig. 1). One may see that the figure is divided first into what is often referred to as "reading competence" and "reading preference" (or occasionally "reading performance"). The distinction is made primarily on the basis of the criteria used. Competence is usually associated with a set of standards of performance to which a number of observers can agree. There may indeed be a national consensus, although as I have indicated earlier, such consensus has not been reached in the United States. Preferences, on the other hand, appear to be desired behaviors, but the standards are either vague or idiosyncratic. They usually refer to what the student "will do" as opposed to what the student "will be able to do." Often, too, they remain unmeasured except at a descriptive level; they are hardly used to determine the academic success or failure of the student, although they may have diagnostic value. Nonetheless they are often seen as constituents of the "good reader" and are cited as curricular goals (Purves 1971). A good school reader, for example, will choose to read writing of quality and will avoid "trash."

As one moves to the next level of specificity, one sees that reading competence comprises three distinct acts: the acquisition of knowledge, the application of certain processing skills, and the use of certain analytic techniques. Each of these may be connected to a major approach to verbal comprehension: the "knowledge-based," the "bottom-up," and the "top-down" (Sternberg, Powell, and Kaye 1982). Although these approaches have had their partisans, Sternberg et al. argue that they are complementary, and common sense would tend to support that argument. It is apparent that to read any text, particularly literary texts, a reader needs to bring to bear background knowledge, reading skills, and comprehension strategies (Purves 1971).

Preference also is composed of two complementary activities, what one might call habits while reading and preferred styles in discourse about reading. The first group includes such operations as developing and adjusting rate to suit the text and the task. A good reader does not read a poem in the same fashion or with the same speed as might be used with a novel. Similarly a good reader will adjust rate for a mathematics text and a history text. In addition to rate, the good reader may also automatically change the method of marking a text; a history text might call for the use of a highlighter, a mathematics text the use of paper and pencil. Reading interests might be said to belong to this group of behaviors as well, for school reading demands

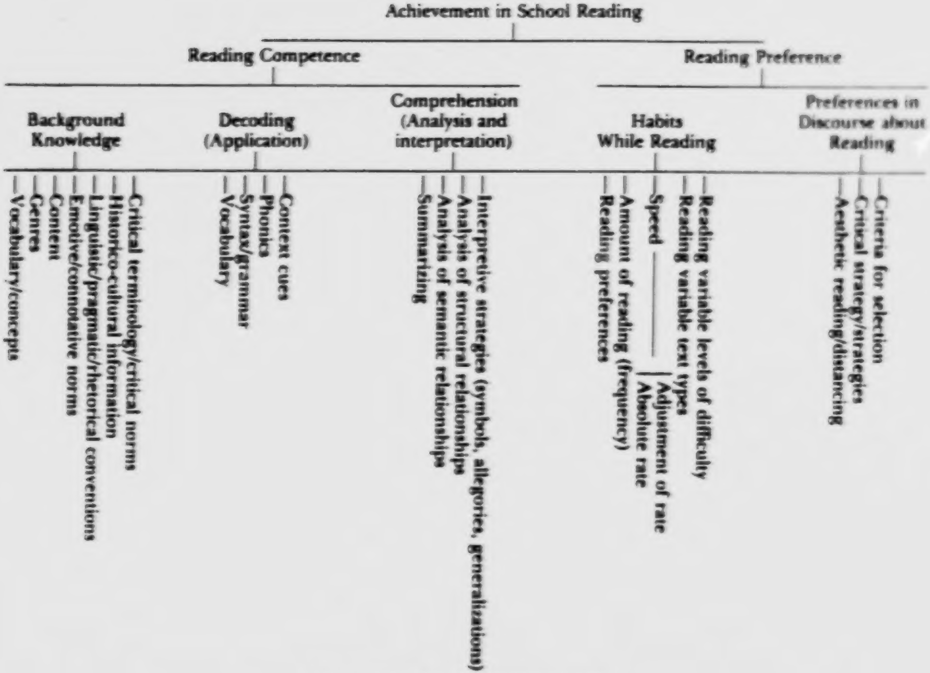
Achievement in School Reading
Reading Competence
Reading Preference
Background Knowledge
—Critical terminology/critical norms
—Historico-cultural information
—Linguistic/pragmatic/rhetorical conventions
—Emotive/connotative norms
—Content
—Genres
—Vocabulary/concepts
Decoding (Application)
—Context cues
—Phonics
—Syntax/grammar
—Vocabulary
Comprehension (Analysis and interpretation)
—Interpretive strategies (symbols, allegories, generalizations)
—Analysis of structural relationships
—Analysis of semantic relationships
—Summarizing
Habits While Reading
—Reading variable levels of difficulty
—Reading variable text types
—Speed
Adjustment of rate
Absolute rate
—Amount of reading (frequency)
—Reading preferences
Preferences in Discourse about Reading
—Criteria for selection
—Critical strategy/strategies
—Aesthetic reading/distancing

FIG. 1.—The domain of school reading

a shared taste, what might be called a middle-brow culture as expressed in the kinds of reading students should habitually select when given the opportunity.

Preferred styles in discourse refers to the kinds of talk or writing about a text that students are called upon to perform and that they later choose to perform voluntarily (Purves 1971). By the end of secondary school, a student is expected to be able to read a literary text aesthetically (Rosenblatt 1978)—that is, to enter into a "transaction" with the text under the terms of which contemplation rather than subsequent action reigns supreme. At the same time, readers are not to become so involved personally with the text that they cannot view it as an object; readers are to develop the role of the "spectator" rather than the "participant" (Applebee 1978). Furthermore, readers are expected to talk or write about the text in certain specified ways—to talk about meaning or theme and about how theme and meaning are presented, for example, or to talk about the historical background of the text (Purves, Foshay, and Hansson 1972). If such is true of language classes, I suspect similar results would be obtained in talking about science reading or history reading. Those texts are not to be read aesthetically. These sets of preferences constitute what Stanley Fish (1980) has called being a member of "an interpretive community." Communities also have shared perceptions, predilections, and language. By sharing these preferences, readers may discuss texts with one another; interpretive communities may be as small as a single class, or they may be broader, encompassing a type of classroom or an entire society.

I have said earlier that competence and preference are intertwined. Evidence for this assertion comes from the finding of survey research in achievement in literature that students at the end of secondary school who share the approach to a text that is favored by teachers are also the students who perform best on a measure of the comprehension of texts. The good reader, it would appear, simultaneously learns the "approved" questions to ask when discussing or writing about a text (Purves, Harnisch, Quirk, and Bauer 1981). Again, I would argue that the style of discourse would mark the good reader in history or science.

The Role of Knowledge

Having moved from the general activity of school reading to its constituent acts, one can begin to break these acts down further to the specific acts and operations that underlie the broader activities. Perhaps one can illustrate these activities best by examining the various acts and operations that would constitute a good reader's reading of a particular text. I shall illustrate by using as examples a poem that has frequently appeared in the secondary school curriculum, the sonnet by John Keats, "On First Looking into Chapman's Homer," and an excerpt from *The National Geographic* (Grove 1976, p. 175).

> Much have I travell'd in the realms of gold,
> And many goodly states and kingdoms seen;
> Round many western islands have I been
> Which bards in fealty to Apollo hold.
> Oft of one wide expanse had I been told
> That deep-brow'd Homer rules as his demesne;
> Yet did I never breathe its pure serene
> Till I heard Chapman speak out loud and bold:
> Then felt I like some watcher of the skies
> When a new planet swims into his ken;
> Or like stout Cortez when with eagle eyes
> He star'd at the Pacific—and all his men
> Look'd at each other with a wild surmise—
> Silent, upon a peak in Darien.

> Astride a gleaming motorcycle, Felipe Brillembourg roared into a dawn filled with the hum and smog of Caracas traffic. Ahead lay a busy day: four hours of teaching engineering at Simon Bolivar University; a planning session for a graduate program; a meeting with an industrial group to form a new chemical company; consultation with his stockbroker.
>
> At 25, the sixth-generation descendant of Dutch immigrants to Venezuela finds it easy to become involved in matters of national development, for his is a nation thirsting for technical skills. "There is terrific challenge for young people here," he had told me.
>
> At the same time that Felipe was weaving his way through the bumper-to-bumper snarl of the *autopista*, a Yanomamo Indian was padding along a forest path near the headwaters of the Orinoco River. A tapir had been sighted near the village of Hasubowateri, and its 300-pound bulk would feed many families.
>
> The Indian's hand gripped a palm-wood bow and three seven-foot arrows made of cane, and his eyes scanned the dense foliage as he ran along the path. Raiders from another village were expected, and ambush is the accepted method of warfare among these forest people. The Yanomamo tongue has no words for "national development."

It has long been known that, in order to read a text, a person must know the words in the text. Various research studies have indicated that a person needs to know about 75 percent of the words in order to get a general idea of a passage and 90 percent of the words in order to answer more specific questions. In both passages there are words that appear a bit more incidental to the reading than others; "Darien" need simply be recognized as a place name, and a "tapir" as an animal. "Apollo" is probably more crucial to construing the meaning, although one could figure out that he must be the god of poets, but to figure that out the reader must know the meaning of both "bards" and "fealty." In addition to the words, however, a good reader would appear to have to know something about genres, at least that Keats's poem is a poem; if the reader knew that it was a Petrarchan sonnet, the reader would also know that the division of thought will occur after the eighth line. Similarly, if a reader knew that paragraphs represented units of meaning in prose, the reader might be better able to see that the paragraphs in the Grove passage establish a structural relationship of ideas.

Whether one needs to know something of the content of a passage before reading the passage has been discussed extensively, but it appears clear from recent research that some prior knowledge is indeed helpful. To know something about South America, if not Venezuela, helps a reader deal with the prose piece, just as knowing that Chapman was a translator of Homer helps with the sonnet. In neither case does the text provide that information; it assumes it. As Updike remarked in an interview, "I trust the reader's head to have something in it."

In addition to specific content in the text, the reader of literature often needs to have some historico-cultural information. It is not enough to know that Homer was a poet; a reader needs to know that Homer was considered the first great poet and that his epics have influenced virtually all European poets. Similarly, one needs to know something of the history of exploration in the New World. It is less important to know that Keats's poem was written shortly after the discovery of the planet Uranus. It is probably also less important to know something of Keats's life and his lack of education, particularly his lack of Greek, which set him apart from most of his contemporary poets.

In addition to knowing the denotation of words, a reader needs to know the connotative value of words. "Astride a gleaming motorcyle" suggests opulence and power, and Brillembourg is to be seen as someone quite different from a Hell's Angel. "Hum and smog" and "bumper-to-bumper snarl" also help to help create an image of the city that contrasts with the single Indian with his three arrows. Knowledge of connotation also aids the reader of the sonnet, particularly when dealing with the dead metaphor "eagle eyes." Most connotations are a matter of norm or convention that a writer is relatively sure a reader shares.

As important as these conventions are, even more so, perhaps, are the grammatical and syntactic conventions that writers also assume readers know. Both passages use inverted structures, for example, which might be confusing to a reader who did not know that the subject may follow the verb in a declarative sentence.

School reading also assumes a shared knowledge of certain metalinguistic terminology. Included in this category relevant to these two passages might be terms like "noun," "verb," "sentence," "paragraph," "comparison," "cause-effect," "foot," "line," "metaphor," "image," "symbol," and "sonnet." Some have also argued that, to read a poem, a person also needs a fairly good knowledge of phonetic, grammatical, and syntactic linguistics (Laff 1984). These terms and the concepts behind them occur frequently in tests, even tests of reading comprehension given in junior high schools. The possession of these terms and concepts aids the reader in discourse about the text, if not in actually comprehending the text.

It would appear then that a fair burden of knowledge rests on the shoulders of a good school reader. Many times that knowledge is presumed by teachers and evaluators. As we shall see later, it is the lack of this knowledge that lies beneath the relatively poor performance of students in the United States. Although people read to acquire knowledge, it seems appropriate to venture that much more knowledge goes into reading a text in school than emerges from it.

Skills and Abilities

Much of the knowledge that has been acquired is transformed into a skill that is applied to a text, such as decoding the text. One applies one's knowledge of vocabulary, morphology, and grammatical and syntactic conventions to the text at hand. It is the use of this knowledge that underlies the act of using context to determine meaning. For example, a reader uses phonetic knowledge to sound out "autopista," morphological knowledge to determine that it is a compound word, vocabulary knowledge to recognize "auto," grammatical knowledge to determine that it is a noun, syntactic knowledge to determine that it is connected to "bumper-to-bumper snarl." All of this can be used to derive an approximate meaning of the word without ever having seen the word before.

This set of skills forms the focus of reading instruction in the first two or three years of school, wherein each of the acts becomes an activity. In the later years another set of skills becomes the focus, those directed at what has been called comprehension or the derivation of meaning from a text. "Meaning" itself is a multivalent term and has occasioned a great deal of scholarly debate (Purves 1979). It is used to describe the paraphrasable content of a text, the author's intention in writing the text, the consensual interpretation derived by experts, and the average interpretation of a large number of readers and any consensual reading by a designated group (Fish 1980; Wellek and Warren 1956). E. D. Hirsch (1976) distinguishes between meaning and significance, which is what an individual reader "takes away" from the text (or brings to it), and asserts that meaning and significance include not only ideational but emotive and aesthetic aspects.

When a reader derives or makes meaning, the reader both follows certain strategies and applies various schemata to the text. These schemata, also referred to as conventions and frameworks, concern both the content and form of the text, so that a reader will relate the text to previous knowledge of people in Latin America or in developing countries generally or to previous knowledge of sailing, geography, and poets. But the reader will also relate the text to previous knowledge of such structures as comparison-contrast or sonnets and metaphorical relationships. In school reading, such application of schemata becomes an activity, and there is practice in the application of these schemata—what is often referred to as analysis or critical reading. In class, for example, students reading the Grove passage might be asked to discuss the relationship between the first two and second two paragraphs, to note the points of similarity and contrast. In a literature class, students might be asked to look at the rhyme scheme of Keats's sonnet and at the relationship between octave and sestet, as well as to determine what words in the octave indicate that the poet is talking about reading rather than sailing. In an advanced class, they might be expected to note that the word "silent" contains all the major phonemes in the rest of the poem and thus epitomizes the meaning and tone of the poem (Hymes 1958). In either class, students will probably be asked for a summary or paraphrase of the text, to present what is usually referred to as the main idea.

In literature classes, students will also be asked for the underlying theme of the text. When they respond, they will be called on to apply a different set of schemata and a set of strategies that ask them consciously to look at certain phenomena—such as the point of view of the writing, the use of repetition or contrast, the prominence of certain words or phrases, the relation of text to title—and to determine their allegorical or symbolic import. In so doing, they relate the concrete data of the text to an abstraction or to a set of conventions. A student reading a beast fable would be expected to relate the figure of the wolf, for example, to a conventional set of attributes about wolves (greed, viciousness, treachery) and to conclude that the wolf is not an animal but a "shorthand" representation of these characteristics. A reader interpreting the *National Geographic* passage would not have these conventions, but might be expected to see that the two people are both hunters and individual entrepreneurs. A reader interpreting the sonnet, might be expected to talk about the aesthetic experience, which is the theme of the poem, and about the thrill of discovery that can occur when one reads a masterwork.

As one can see, in school, reading a text—either a literary or a nonliterary text—involves a large number of acts and operations, many of which are treated as activities at various points of the curriculum. It is expected that students will become skilled in these various acts so that reading texts and then either talking or writing about them become skills. But there is more to school reading than skill.

Habits and Preferences

Students have to read a great deal in school. Reading is part of every subject area from mathematics to physical education, and students must read thousands of pages during a school year. They are also expected to read voluntarily—to use the library, join book clubs, read books rather than watch television. In short, they not only must read as a part of the job of being a student but they have to like it and become "lifelong readers" or "recreational readers," two terms often used in school objectives. More than that, they must develop the capacity both to increase the absolute rate of their reading so that they can read a 300-page novel in a day and to vary the rate of their reading according to the type of text. At the secondary school level, a long assignment in history might be 60 pages; a long assignment in mathematics might be one page. Both are to take equal amounts of time; what distinguishes them are the propositional structure of the text material, the operations and length of time the reader is to remember the content, and the amount of specific information to be remembered.

Not only must students acquire these variations in rate, but also be able to shift from one text type to another on demand. Students must shift subjects every 45 minutes or so and in switching must also adjust their reading rates and the types of comprehension skills required. In moving from a poetry class to a social studies class, for example, they might have to move from an atmosphere where reading a text with metaphors is seen as one of the virtues of the text to an atmosphere where reading such a text is to awaken a sense that metaphors are signs of propaganda.

Yet another kind of habit that students are to develop is "the reading habit" and more particularly the habit of reading more difficult texts and texts that bespeak a middle-brow if not high-brow culture. We know that students' reading interests and preferences change as they pass through school from fiction to nonfiction, from childish characters to adult characters (Purves and Beach 1972; Purves et al. 1972). We do not know, however, the causes of such changes, whether they result from maturation or instruction. One suspects a bit of both, for "good" readers, those who score well on reading tests, have different preferences than their age mates. Such differences probably result from increased performance, which enables readers to seek out more mature texts.

I have said that good students read more difficult texts, but this simplification hides the fact that we really know little of what constitutes the difficulty of a text. Difficulty at times appears to be lexical, syntactic, cohesive, propositional, structural, tonal, symbolic, or a combination of these. Keats uses more complex syntax than does Grove, but he does signal the propositional relationships and Grove does not. Keats uses metaphor and simile; Grove uses symbol. Keats uses rhyme and meter; Grove uses phrasal repetition. I emerge with a vague sense that the sonnet is more "difficult" for a secondary school student than the prose passage, but probably because it is a less familiar genre and it builds on allusion. Nonetheless, I cannot derive nor have others derived an adequate calculus of text difficulty, although Baten (1981) has come closer than most. Still, school readers are expected to read and to discourse about texts that are arranged in some order of difficulty.

The mention of discourse leads to the area of preferred styles that a school reader is expected to develop. Because so much of what is done with school reading involves simultaneous or subsequent discourse, a student inevitably learns some preferred modes and topics of discourse (Purves et al. 1972, 1981). These include what are referred to as response preferences and as explicit criteria for judging or selecting a text, although the two are somewhat intertwined. Based on a content analysis of student writing about literary texts, Purves and Rippere (1968) were able to derive a set of measures to determine what approaches to a writing about a text students preferred. The results of the investigation showed that, although the text determined to a certain extent what questions a school reader raised, by the end of secondary school, students in the United States and other countries had developed a "style of response" that was independent of the text. The style of response was clearly related to the country in which the student lived and to the style of response preferred by the teacher. This finding clearly supports the claim that readers become members of interpretive communities (Fish 1980), which may be as small as a single classroom, but tend to have certain common elements across classrooms that suggest a consensus of communities within a country.

As an aspect of style of response, students tend to learn that certain criteria for selecting texts are preferred. These criteria are not necessarily what they apply in selecting their reading material, but they are aware of the standards of the community that calls one kind of literature trash and another kind classical. They also become able to say something of why trash is called trash and what characteristics might pertain to a classic.

The final sort of preferred styles that is acquired in school might also perhaps be classified as a habit. It is the capacity to enter into what Louise Rosenblatt (1978) has called an "aesthetic transaction" with a text. Rosenblatt distinguishes between "aesthetic" and "efferent" reading, the latter implying that the reader will take something away from the text and that the text is instrumental, whereas the former implies that the reader and that the text is an end. Efferent reading is demanded in most science and social science classes, but not in literature class. The reader in this case is involved with the text and aware of its form as well as its content and seeks to bear away little save the memory of the experience. At the same time, school literature reading demands that the reader also act as critic, that the reader must create a distance from the next so as to talk about the text apart from the experience of reading it. Applebee (1978) refers to this as the "spectator role," following terminology used by Harding (1962). In literature class, the reader is expected not only to experience the text but to perform certain intellectual operations with respect to the text and the experience (Purves 1980). The reader, then, becomes a conscious critic. And in becoming a critic, the reader must bring to a level of conscious activity many of the acts and operations that had become skills and habits. School reading, particularly the reading of literature, then, is a cycle of operations, acts, and activities that form an almost Gordian knot.

The Relation of Growth and Instruction to Achievement in School Reading

Having seen that reading in school is a complex activity, before one can comment about achievement, one needs to examine those acts and operations in the activity that form a part of instruction. It may be that some aspects of reading achievement will ineluctably occur whether a person is specifically instructed in their use or not. Others appear to result from explicit training, and still others may appear to follow from the acculturation that is schooling, what Broudy (1973) calls the interpretive and associative uses of learning. They are acquired as the result of an individual's participating in the workplace that is school. As we examine these issues, we see achievement in reading has been portrayed by people having different psychopedagogical approaches. I would argue that each of the three approaches is a partial view of the situation.

Reading Achievement as Growth

From our earlier survey of the acts of reading, we can deduce that individuals will change in some of these acts simply as a result of growing up and being in the world. Much of the knowledge of the content of reading texts is acquired outside of the classroom, through exposure to realia, television, and other media. Some, of course, may be explicitly taught in various classes, but much is not. I would suspect that only a small portion of the content of the Grove passage would have been learned in school, yet the author and the editors of *National Geographic* can assume much of that knowledge by their readership (which, of course, is restricted to people who one might expect to have the knowledge).

Because much is learned outside of school, writers can prepare materials for children of different ages; they know that their school-age readers will have some knowledge of schools and vacations, that junior high school readers will be aware of sexual maturity and parent-child conflicts, that senior high-school readers will be aware of automobiles, sex, and drugs. Little of the material of "graded" texts is graded because of the curriculum of the schools, most because of the age of the readers.

Research such as that of Chomsky (1969), Loban (1963), and Strickland (1962) has shown that as children mature so does their working knowledge of certain grammatical and syntactic structures. Again, school appears to play a minor part in the acquisition of such knowledge. Although none of the studies looked at unschooled children, most imply that what was learned was not consciously taught. School also plays a relatively small role in the acquisition of a speaking vocabulary, and possibly a small role in the development of a reading vocabulary after a person begins to read voluntarily, although there is little research evidence to support or deny this assertion. It would also seem probable that a knowledge of the connotations of words is also gradually acquired through experience.

What appears to result most clearly from growing up is reading preference, followed by the ability to assume the spectator role. The various reading interest studies clearly indicate changes in preference as students become older and an increased differentiation of the preferences of boys and girls (Purves and Beach 1972). That this is not the result of schooling would seem to follow from the universality of the changes across language and cultures (Purves et al. 1972). School probably has some influence on preferences, but it tends to be localized (VanNord 1980). Similarly, children seem to grow into the spectator role without the benefit of instruction (Applebee 1978). Applebee attributes this shift to the general loss of egocentrism as suggested by Piaget (1926/1962).

It would seem, then, that some aspects of reading achievement and some of the differences observed between younger and older readers are simply a function of growing up. As one grows up, one loses some of the naiveté of the very young reader; despite the attempts of some educational reformers of the late 1960s to hold on to that one aspect of naiveté—the participant role—it too simply dwindles away. Only by a great effort on the part of certain writers of fiction and the acquiescence of readers can it be regained (Cott 1983).

Reading Achievement as the Development of Skills

Most commonly, people in reading education see achievement in reading as the development of skills, from the decoding skills to the skills of comprehending and interpreting texts of varying difficulty. One of the strongest adherents of this view is Jeanne S. Chall, who, in a recent article (Chall 1983, p. 5), attributes most of the changes in performance to instructional practices—"an earlier start, more and earlier phonics, harder basal readers grade for grade, more home instruction, more help to those who needed it, and the like." It would seem clear that most children do receive phonics instruction in school and are taught a sight vocabulary, how to use context clues, and about syntactical and structural complexity—or at least presented with increasingly complex materials. Students are also presented with a variety of content and a lesser variety of text types, particularly after they leave elementary school and are asked to decode those texts and to say something about what they mean.

All of these we can think of as skills that are consciously taught or sequenced so that students will become more proficient in using them. At the same time, these skills have been and are adapted to the level of maturity of the student—or to an assumed level of maturity based on readability formulas—so that students become increasingly adept at dealing with texts presumed to be at their level or a little bit above or below it. The curriculum offers "graded" materials and asks the students to practice the same set of operations over and over again, with the change being only in the level of material, not in the nature of the mental acts and operations assigned. Then in the secondary school there tends to be a shift to a different—or at least a modified—set of acts and activities. At this point "critical reading," interpretation, and analysis of text materials, particularly in literature becomes a staple of instruction in literature classes and less so in social studies.

Achievement as the Development of Discourse and Interpretative Strategies

In secondary school the focus of reading instruction changes, and so too does the notion of achievement that reading becomes almost coterminous with literature. Achievement in reading becomes less a matter of skill balanced by maturity than it does the matter of placing into operation of set of taught strategies of discourse about what has been read. The strategies involved in the derivation of meaning and the analysis of texts included instruction in certain metalinguistic terms, such as the names of genres and structures as well as terms like "plot," "character," "act," "scene," or "personification." The students are asked to recognize these terms and to apply them to a variety of literary texts. But more than label texts or parts of texts, students are asked to use these analytic tools in order to say something about the theme or "hidden meaning" of the text. In some cases, they may even be taught a set of strategies for determining the qualities of a character, defining the point of view, or determining the symbolic import of a text. More often than not, however, the instruction tends to be by example or trial and error (Purves 1980).

At the same time that students are learning these strategies with literary texts, they are learning to use different or at least modified strategies with other school texts. They are also taught—or at least they learn—to modify their habits of reading according to the subject of the text, the course, and the desired outcomes from having read the text. Most important, however, students are being taught what the appropriate forms of oral or written discourse about a text might be for different subjects. In secondary schools in the United States, for example, students in literature learn that it is most appropriate to talk about the content of the text rather than its form, to talk about the text's meaning and moral rather than its aesthetic effect (Purves et al. 1981). This situation extends to other subjects, where the rhetoric of a text is virtually ignored except in the occasional lesson or propaganda. As we shall see in the next section, they appear to learn what is expected of them when they discourse about a text, although they might not do it very well.

Achievement in school reading, then, is again a complex of acts and operations, habits, and preferences, some of which accompany maturation, but many of which are taught. There is also a shift in the instructional emphasis that occurs sometime in junior high school and that appears to cause some disjunction as to both the definition of achievement and the degree to which U.S. students fulfill those definitions.

To talk about the potential achievement in school reading by U.S. students is to raise a set of issues that have gone relatively unnoticed in educational measurement. In seeking to specify the domain more precisely, we have seen that the range of skills, habits, and preferences is large. We have seen that there is a lack of certainty as to what might constitute a difficult text. And we have seen that we are dealing with skills, habits, and preferences that might result from instruction as well as maturation. It would appear that the potential achievement of students would comprise something like the following: the capacity to decode, comprehend, and talk or write in preferred modes about a variety of texts, dealing with a variety of subjects, in a variety of genres and styles, having greater or lesser degrees of allusion to a larger body of literature, and having a variety of connotative or tonal qualities; the capacity to perform these acts and operations on demand; the willingness to perform these acts and operations both in and out of school; and the readiness to see that these acts and operations have value and that there are degrees of quality in texts that have been determined by custom. If this definition seems daunting, let me add one further thought: reading is essentially an internal act that is solitary and private; achievement in school reading demands a variety of forms of utterance and exposition concerning this internal act, so that when we measure the potential achievement of students, we are never entirely sure that we are measuring reading skill; we may be measuring expository skills.

What Is Known about the Achievement of U.S. Students in Reading

Although there have been many surveys of reading achievement in the United States, it is clear from the preceding discussion that many of these surveys have limited themselves in their definition of the domain or have not bothered to be comprehensive. Very few assessments of reading in this or other countries have paid attention to the issue of prior knowledge in the construction of measures; even fewer have sought to look at habits and preferences. Most have limited themselves to the use of a single type of measure—either the passage followed by a set of multiple-choice questions or a cloze-type exercise with a passage that has missing words or phrases that must be filled in. Both types of test tend to focus on the skills of literal reading, with very little attention given to more complex issues of comprehension. One of the reasons for this limitation is the limitation of the multiple-choice or cloze format and their inability to handle any sort of ambiguity (Purves 1971, 1981). It is quite clear from the discussion of the domain of school reading that a program of measuring achievement would be a highly complex undertaking indeed.

Only two surveys have attempted to look at the broad spectrum of achievement of students in reading and literature: the National Assessment of Educational Progress (NAEP) and the International Association for the Study of Educational Achievement (IEA) studies of reading and literature. The former has been carried out periodically since the late 1960s; the latter was carried out in 1970 and will probably not be repeated until 1990. In some ways the studies can be compared, but in other ways they cannot, primarily because of the multiple matrix sampling used in the NAEP, which has prohibited intertask correlations.

In 1981, the National Assessment of Educational Progress produced two reports on the changes in achievement in reading over the preceding decade. One report (NAEP, 1981*b*, p. iii) gave the following picture:

> Results of three reading assessments indicate that significant gains by 9-year-olds, first observed between the 1971 and 1975 assessments, continued into the third reading assessment. Performance of 13- and 17-year-olds remained relatively stable from the first to the third assessment, with 13-year-olds gaining slightly in literal comprehension while 17-year-olds declined slightly in inferential comprehension.
>
> Nationally, 9-year-olds' overall reading performance level rose 3.9 percent. They made significant gains in reference skills (4.8 percent), literal comprehension (3.9 percent) and inferential comprehension (3.5 percent).
>
> The largest gains among 9-year-olds' reporting groups occurred for black students (9.9 percent), students who reside in the Southeast (7.5 percent), those who attend schools in rural communities (6.0 percent) and those who attend schools in disadvantaged urban communities (5.2 percent).

Nationally, 13-year-olds registered a significant increase in performance in literal comprehension from the first to the third assessment.

The only significant overall gain among the 13-year-olds' reporting groups occurred for black students (4.2 percent).

Nationally, the performance level of 17-year-olds declined significantly (2.1 percent) in inferential comprehension.

Three groups at each age—students in the Southeast, blacks, and males—narrowed the gap between them and the nation, although they continue to perform below the national level.

The other report (NAEP, 1981a, pp. 1–2) presented the following summary:

What Students Can Do

1. Almost all students recognized the value and utility of reading.
2. By age 17, most read a range of materials appropriate for their age level.
3. Older students displayed stronger comprehension skills and were more versatile in writing about what they read than were younger students.
4. By age 17, most students expressed their *initial* ideas and judgments about what they read, particularly when these involved personal reactions.
5. Older students provided more evidence to support their assertions than younger students.

Countervailing Tendencies

1. Teenagers read little for their own enjoyment, spent more time watching television than they spent reading, did not read for long periods of time and preferred movies to books.
2. About 10 percent remained unable to read even simple materials.
3. Older students displayed less commitment to reading than did younger students.
4. Very few students at any age *explained* their initial ideas and judgments through reference either to the text or to their own feelings and opinions.
5. The evidence cited by older students does not reflect effective strategies for approaching a text; explanations remained superficial and limited. The overwhelming majority of students lacked strategies for analyzing or evaluating in the interest of deepening their understanding of what they read.

The most significant finding from this assessment is that while students learn to read a wide range of material, they develop very few skills for examining the nature of the ideas that they take

> away from their reading. Though most have learned to make simple inferences about such things as a character's behavior and motivation, for example, and could express their own judgments of a work as "good" or "bad," they generally did not return to the passage to explain the interpretations they made.

These results from NAEP show most clearly the problem that was referred to at the end of the last section. It would appear that by age 17 a large proportion of U.S. students have the skills of reading; they tend to lack the expository writing ability that is demanded by school reading. We do not know whether this is a failure in reading or in writing. There is some evidence from a Swedish study that this difference has not been fully appreciated (Hansson 1964). In that study, using the semantic differential and an open-ended response, Hansson found no difference on the first measure between three groups of people: adults who had finished comprehensive school, university students, and university professors. The first group, however, was unable to write more than a sentence or two about their understanding of the text. The semantic differential showed these adults could read; they could not perform the activity demanded of school readers. Such seems to be the case of U.S. students at the end of secondary school. This is not a startling finding; it differs little from what I. A. Richards (1929) found among Cambridge graduates.

If we turn to the IEA studies, we find some confirming evidence for the NAEP findings (figs. 2 and 3). The comprehension scores on nonliterary and literary texts by 14-year-olds are slightly above an international mean, those of 17-year-olds below that mean. U.S. students perform about as well as the mean on measures of reading speed, but 17-year-olds rank very poorly on measures of vocabulary and interest. They do tend to evidence a great deal of personal involvement in what they read. Making international comparisons, however, is risky for means tend to hide that a range exists among national school systems of the proportion of 17-year-olds in school or retentivity. If one adjusts these mean literature scores of 17-year-olds for retentivity, one finds that U.S. students perform better than the students of most other countries in the study (fig. 4). Again, these findings corroborate the NAEP findings that our very "good" students are very good indeed.

The IEA study also examined the "response preferences" of students and found that U.S. students tended to concern themselves with symbolic meanings, themes, and moral interpretations and to a lesser extent with structure and literary devices. Their choice correlated quite highly (.50) with that of their teachers. The students in secondary school appear to be well on their way to being members of an American

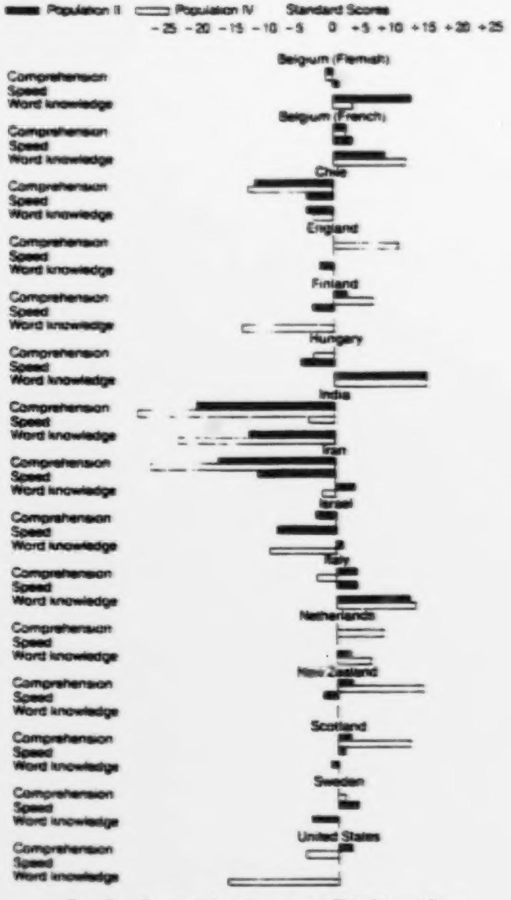

FIG. 2.—Cross-national score profiles for reading

interpretive community. Unfortunately, the IEA studies did not include an open-ended response (except for a very small subsample); therefore the issue of expository abililty cannot be determined. However, the study did look at the correlates of achievement and found that the best readers by the end of secondary school tended to be girls (particularly in literature) from high socioeconomic groups and that these students

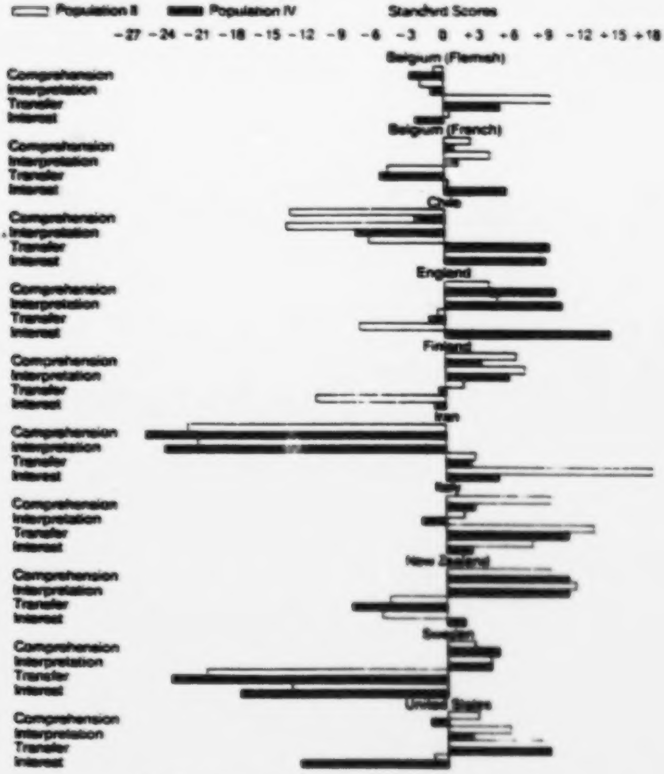

FIG. 3.—Cross-national score profiles for literature

also most closely conformed to the interpretive norms of the school, most frequently read on their own, and most frequently expressed interest in reading and literature. They also tended to watch more television than the poor readers; they seem to do more of everything.

One aspect of the IEA test that was further studied (Purves et al. 1981) was the performance of students on different item and text types. That analysis revealed that, with both nonliterary and literary texts, the most difficult items for 14-year-olds were those that required the students to use metalinguistic terms of which they had little knowledge, such as "metaphor," "cause-effect," or "comparison-contrast." These students also had the most difficulty with passages that were not narratives, again suggesting little exposure.

From both of these studies, it would appear that U.S. students are by and large fairly well grounded in many of the skills associated with reading, particularly in the skills related to understanding narrative texts. As the various reports of the Center for the Study of Reading have pointed out, these skills represent what is present in most school reading programs up through the fourth or fifth grade. U.S. students do not do particularly well in the many other aspects of school reading that we have outlined. Their word knowledge appears weak, as does their knowledge of literary terms and allusions and their ability to read diverse text types and handle the expository aspects of school reading. They do, however, seem to join the symbolic-moralistic interpretive community that has characterized U.S. readers since the landing of the Pilgrims. Nonetheless, a few quite successful readers remain, proportionally as many as in other countries.

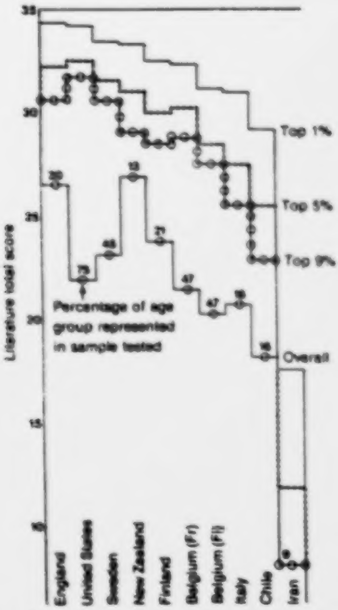

FIG. 4.—Degrees of excellence in population IV (secondary school seniors) for literature, giving the mean scores of top 1 percent, 5 percent, 9 percent, and overall group.

Conclusion

Student achievement in reading has to be seen in the context of school because that is where reading is taught, and school reading is a complex activity made up of skills, habits, and preferences, both in the activity of reading and in the various kinds of exposition about what has been read. A reader in school becomes part of a community of readers who share certain values and habits of discourse as well as habits of reading. Achievement in reading appears to result from a combination of maturation, exposure, and instruction. At the same time the real effects of school reading must be seen in what is read and what is said about what is read by the adult population.

In the United States, schools appear to do a fairly good job with some of the aspects of reading, but they seem to fail to do well with the expository aspects of school reading—at least for a majority of students. One might say that this result represents a failure on the part of the U.S. school system, but a cross-national comparison suggests that the failure is shared by most other countries. We keep our less able students in school longer than do many other countries. They do appear to learn something while they are in school, and perhaps many of them are at least awakened to the potential of school reading. It may well be too much to hope that a larger proportion of the population will become good school readers. At the same time, I believe that we should try with all of our students. Perhaps if we try harder and are more explicit about what we mean by school reading and more explicit in our teaching, we can increase the proportion.

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Foreign Language Study: One of the Basics

Like math and science, the teaching of foreign languages should be emphasized in our schools

by Kenneth D. Whitehead

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We have been hearing a lot lately—and happily—about getting "back to basics." There can be no doubt that the decline in standards that marked the late 60s and early 70s was harmful to education, not the least to the students in those years. Hence, the current return to standards and the new aspirations toward excellence are among the signs that the "back to basics" movement is a genuine trend.

I am disturbed, however, that the new emphasis on basics sometimes seems limited to skills in reading, writing, mathematics, science, and engineering. Not that the trend toward higher standards in these disciplines is anything but commendable, but I sometimes miss any reference to the desirability of higher standards in the teaching and learning of foreign languages. It is not that they are never mentioned, but that they are not mentioned as frequently as science or math. For some reason, foreign languages no longer seem considered "basic." The fact that this is so may mean that we still have some way to go before we really arrive back at the "basics."

Knowledge of foreign languages was once considered the hallmark of the truly educated. Over many generations a classical education based on the study of Latin and Greek constituted one of the principal entrance examinations into positions of influence and importance within governing classes of Europe—at a time when Europe controlled a good part of the rest of the world.

Even though education in the United States rightly aimed at educating larger numbers and educating them more broadly, concurrently aiming at greater equality of opportunity, the fact remains that our overall educational standards were higher when they bore some resemblance to the old model of the classical education. Nor was it a question of a purely "literary" education. During the great age of basic scientific discovery—the seventeenth century—Latin was the language in which the educated communicated with each other across national boundaries. Latin was the language in which Newton and Spinoza wrote up their findings and philosophies.

It was not long ago that the study of Latin was justified in the public schools of the United States as "training for the mind." That is forgotten today, perhaps, as well as that the study of any language is training for the mind.

Learning for learning's sake

In the midst of the scientific and technological revolution in education in which we are currently engaged—and also considering the continuing commitment of American education to equality of opportunity—there is little likelihood of the return of the old elitist classical education, even if that were really desirable. At least one of the things that we should retain from the old classical model, however, and adapt to suit our present needs, is the basic idea that some things really are worth mastering for their own sake, quite apart from their utility. We are much too taken up today with the idea that education must necessarily be *for* something else. Yet, it is a commonplace that many of the basic discoveries on which our present scientific and technological revolution is based were originally discoveries of "pure" science and mathematics pursued for the purpose of learning new things.

A complete education must include the mastery of many and various disciplines and bodies of knowledge. This is one of the things the term "getting back to basics" should mean. I believe foreign languages fall into the category of things that deserve to be studied for their own sake, if for no other reason

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Why study foreign languages?

Of course, there are other reasons for studying foreign languages, and some of them are eminently practical ones. Most of us have heard the stories (too many of them all too deplorably true) about how bad Americans are at learning and speaking languages compared with almost anybody else at all. The monolingual ugly American abroad may all too often be typical of American education, in fact. About 20 percent of the high schools in the United States are said to teach no foreign language at all and only some eight percent of all United States colleges have a foreign language requirement for entrance.[1] By contrast, in 1915, when the United States was barely on the threshold of the role in world affairs the country occupies today, some 85 percent of the Nation's colleges required for entrance that a student pass a competency test in a foreign language.[2]

It is often stated that there are more teachers of English in the Soviet Union than there are students of Russian in the United States. Less than one percent of all U.S. students at all levels study the languages spoken by three-fourths of the world's population.[3] Nor is the problem limited to the low priority accorded foreign language study in some U.S. curricula. There is also the quality of the study undertaken and the effectiveness of its results. Fewer than three percent of those high school students who study a foreign language are said to end up with any "meaningful" competence in it.[4] Even those who complete foreign language college courses do not necessarily have a working knowledge of the language they have studied. When I entered the U.S. Foreign Service, two-thirds of my class of officers—all supposedly outstanding products of American colleges and universities who had studied one or more foreign languages—had to undergo immediate on-the-job language training to come up to the State Department's minimum standard of competence in a foreign language. And those were the days when the State Department *had* a requirement for competence in a foreign language for entry into the Foreign Service; since then that requirement has been dropped.[5] Of some 15,000 positions currently designated as "language essential" by the Department of Defense, less than 50 percent are in fact filled by incumbents with the requisite knowledge of languages.[6]

Findings of the President's Commission on Foreign Language and International Studies

Citations such as these abound in the literature concerned with modern foreign language teaching and learning. Moreover, the problem has been around for some time. In 1978, a President's Commission on Foreign Language and International Studies was named to study the problem and to recommend solutions. Some of the salient facts gathered by this Presidential Commission about what it called "Americans' scandalous incompetence in foreign languages" continue to be well worth pondering:

- Only 15 percent of American high school students now study a foreign language—down from 24 percent in 1965. (In 1915 the percentage was 36 percent.)[7]
- Only one out of 20 high school students studies French, German, or Russian beyond the second year. (Four years is considered a minimum prerequisite for usable language competence.)
- Only 8 percent of American colleges and universities now require a foreign language for admission, compared with 34 percent in 1966.
- It is estimated that there are 10,000 English-speaking Japanese business representatives on assignment in the United States. There are fewer than 900 American counterparts in Japan—and only a handful of those have a working knowledge of Japanese.[8]

The work of the President's Commission served to focus greater attention on these problems. The Commission also made a number of recommendations, some of which may have helped inspire at least the modest beginnings of some solutions. For example, a number of colleges and universities have been reinstituting their foreign language requirements for both entrance and graduation since the President's Commission issued its report.

MLA documented decrease in foreign language requirements by 1975

In a series of surveys of institutions granting the B.A. degree, the Modern Language Association (MLA) documented how the foreign language requirement for the B.A. degree declined at such institutions from a high of nearly 90 percent in 1966 to only around 53 percent by 1975. In its census of enrollments the MLA has also shown how the percentage of college students studying foreign languages fell from nearly 18 percent in 1965 to only around 9 percent in 1980. Enrollment in language courses in French, German, and Russian suffered precipitous declines.

In a 1981 survey conducted following the Report of the President's Commission, however, the MLA discovered that nearly seventy institutions had restored a foreign language requirement, either for entrance or for the B.A.; and that these institutions included such well known names as Duke, Georgetown, Indiana, Southern Illinois, Stanford, and Tulane Universities; and the Universities of North Carolina at Chapel Hill, California at Berkeley, and the State University of New York at Buffalo. Meanwhile, the MLA 1980 census of enrollments showed increases for such uncommonly taught languages as Arabic, Chinese, and Japanese; and even French began to show a slight increase again.

In round figures, around 20 percent of institutions granting the B.A. degree now have a foreign language entrance requirement, while possibly more than 60 percent of these institutions have one for the B.A. degree itself.

Thus, there has been some slight improvement from the lows of the late 60s and early 70s. Other indications could be cited showing that a modest but salutary trend might be in the making toward greater interest in studying foreign languages. Certainly the attention focused on the problem by the President's Commission has been an important factor and we may hope that the issues raised by the Commission will continue to get the attention they deserve.

I think the most important issue in foreign language education involves the basic attitude we have toward such education and the value we place upon it. There will no doubt always be takers for Federal—or other—monies made available for whatever laudable purpose. Sometimes some marginal good might even be accomplished by this approach. But, it is not clear that we will ever obtain the foreign language education our Nation needs until a fair number of Americans believe that foreign languages are worth studying; and this gets back to our fundamental attitudes and values.

Here, too, we return to something I stated at the outset: Foreign languages need to be studied, first of all, for their intrinsic value—just as pure science or mathematics or literature or art or music are studied. Few students will really be motivated to subject themselves to the rigors of mastering a foreign language merely to keep up with the Russians or the Japanese, to increase American exports, or to be a slightly less ugly American abroad, but many students will respond to the challenge of a foreign language if given the opportunity simply because, like Mount Everest, it is there. Many students will study a language as many study music or art, for the sheer joy of mastering it. Learning and using a language is something human beings are naturally programmed to do and they normally revel in it just as one takes satisfaction in developing an athletic skill. The younger one is the truer this is. I majored in languages in college because I had learned, while in the Army overseas, that I was able to learn languages; it was as simple as that. It was only later that I put my knowledge of foreign languages to use in building a career.

There are, in fact, many uses for a real knowledge of foreign languages, as we have briefly intimated. Some of them are indeed national priorities, but there are no uses for them if they have not first been acquired. And in a monolingual society such as the United States is in danger of remaining, we have to address ourselves first to some of the fundamental attitudes which motivate human beings to want to learn anything. This requires that, as a society, we place a value on learning languages, that we affirm that learning languages is worthwhile. The uses will follow automatically, later.

Educators can help change attitudes about foreign language study

If I am correct in my estimation that the core problem in foreign language education really concerns our basic attitudes and values more than it concerns demonstrating for the nth time that language competence is needed, what can we, as educators, do? A few simple suggestions:

1. Let us all agree, first of all, that foreign language study constitutes one of the "basics." This should be a matter of fundamental education philosophy. Only if we agree on that will schools be motivated to offer foreign language courses and students to take them.

2. If we truly agree that foreign language study constitutes one of the "basics," then schools at all levels will have to provide the courses to fulfill that basic need, just as such courses are now being offered in mathematics and computers in response to the value we place on those subjects. The attitude of educators and school administrators is critical here. If language courses are allowed to be perceived as optional or expendable, they will too often be perceived and treated that way and hence will not be considered among the "basics." On the other hand, if educators and schools continue to insist that language study is important, even if they have to teach in relatively empty classrooms for the present, the idea will be communicated in the long run.

3. Colleges and universities have a particular responsibility to maintain or reinstate the foreign language requirement for the B.A. degree. Doing so will continue to be one of the principal stimuli for encouraging serious language study. Even more important, however, could be the reinstatement of a language requirement for college *entrance*. That would be the single most effective way to expand language study in the high schools, motivate high school students to take language courses, and, not incidentally, prompt parents to support the whole effort. Probably every study that has been done shows that languages are learned better the earlier their study is begun; foreign educational systems that teach successfully their students a foreign language have demonstrated this.[10] However, foreign language study will only become widespread in our elementary schools when its value as a "basic" is accepted and taken for granted at the higher levels of education and in our society at large.

4. Schools and educators should plan language curricula to give students the opportunity to pursue enough continual consecutive study of a language to acquire some meaningful knowledge of it. This should be done, if necessary, at the expense of offering a diversity of foreign languages that cannot be carried on to any kind of real proficiency level. A student who succeeds in acquiring some real proficiency in even one foreign language will be better able and motivated to try another (or to progress in the language begun). Particularly in these days of budget constraints, it is more important for a school to maintain an adequate course in at least one foreign language than inadequate ones in several.

5. As part of the affirmation that language study is

(continued on page 14)

one of the "basics," language teachers should be considered for the same kinds of pay and status differentials that are being discussed to encourage excellence in the teaching of mathematics and science. As it is, a high percentage of those teachers now retraining at all levels of education to teach computer courses are probably coming from the ranks of language teachers—all because foreign language education today is not considered to be one of those "basics" we need to get back to. The beginnings of a change in this unfortunate attitude surely can and must be wrought among individual schools and educators; they, after all, have a responsibility to help society define and maintain the ideal of the truly educated person; and that ideal should include a knowledge of foreign languages. ■

14 March 1983

NOTES

1. *Newsweek*, November 15, 1980, p. 17.
2. Simon, Paul. *The Tongue-Tied American: Confronting the Foreign Language Crisis*. The Continuum Publishing Corporation, 1980, p. 5.
3. News Release of the Joint National Committee for Languages, November 19, 1980.
4. *Newsweek*, loc. cit.
5. Simon, op. cit., p. 6.
6. JNCL News Release, supra #3.
7. Simon, op. cit., p. 8.
8. *Strength Through Wisdom: A Critique of U.S. Capability*. A report to the President from the President's Commission on Foreign Language and International Studies, November, 1979, p. 6. Those wishing to have a copy of this Report from the President's Commission may request one from the Office of International Education Programs, Office of Postsecondary Education, U.S. Department of Education, Washington, D.C. 20202.
9. "Survey of Foreign Language Entrance and Degree Requirements in U.S. Colleges and Universities, Fall, 1982"; "Preliminary Report on College and University Entrance and Degree Requirements in Foreign Languages, 1980-81." Papers prepared by the Modern Language Association of America (Richard I. Brod).
10. See the list compiled by Simon, op. cit., pp. 78-98.

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The Dangerous Decline in U.S. Science Education

SCIENCE EDUCATION is in rapid decline in the United States, and the price to the country is nothing less than a dangerous undermining of our economic health, productivity, and national security. Other countries, including China, Japan, the Soviet Union, and West Germany, are investing heavily in science education for all of their students. They know that it takes a steady flow not only of scientists and engineers, but also of technologically literate workers and leaders, to flourish as a strong and technologically sophisticated country. At the same time, our own science-education system is deteriorating, especially at the precollege level.

The complexities of the education system make it difficult to reverse this trend. The need for strong educational programs in science, mathematics, and technology is national, yet action must be taken in tens of thousands of separate school districts, at thousands of individual colleges and universities, in 50 different states, and by a private sector made up of legions of independent companies and organizations.

Clearly, the solution to the crisis is to form and energize a national partnership—a cohesive, coherent, and determined effort at all levels and in all sectors. Individual schools, colleges, and corporations, and every state, have an essential role to play, but the role of the federal government is unique and absolutely necessary.

The deterioration of our system of science education is evidenced by declining test scores, fewer students at all levels electing to take courses in science and mathematics, and complaints from industry that employees have been insufficiently trained to carry out their work.

A look at the system reveals that:

▶ As the school population shrinks in the next two decades, it will become increasingly difficult to maintain an adequate supply of highly qualified scientists and engineers. To address the shortfall, we need to increase our efforts to recruit people, including greater numbers of women and members of minority groups, capable of becoming scientists and engineers—not only as a matter of equity, but also for our common good. Such programs as the Resource Center for Science and Engineering Education, graduate fellowships for minority-group members, and summer laboratory experiences for high-school students have, with very limited funds, begun to show impressive results. And various programs for attracting women to science—such as the Women Moving Up project, sponsored by the National Science Foundation at the University of California at Berkeley—have been very effective. These are programs that states and local communities have not been able to support by themselves and would not be able to initiate at this time.

▶ At the elementary-school level, instruction in science has almost ceased to exist. In most classrooms, it is no more than a few minutes a week of reading from textbooks—a deplorable situation that developed when the federal government withdrew funds for specialists to help teachers conduct interesting science activities for children.

▶ In secondary schools, we are seeing a dramatic and disturbing decrease in the quality of science and mathematics teachers. Many of the best are, for understandable reasons, leaving teaching for jobs in industry, and often the resulting vacancies are filled by teachers with little or no training in science or mathematics. Undergraduates are not choosing to prepare for careers in teaching science or mathematics, the schools aren't hiring science and mathematics teachers, and the system is simply winding down.

▶ Our undergraduate institutions educate not only scientists and engineers, but also politicians, business people, lawyers, and all the other people who make the day-to-day decisions that determine the direction this country will go in. They must be prepared to operate effectively in a world dominated by science and technology; but the tasks of developing new courses, outfitting laboratories, and producing current learning materials are beyond the resources of most institutions.

In the past quarter of a century, the strength of our colleges and universities in the technical fields was in great measure due to the National Science Foundation's investment in improving undergraduate and graduate science education. With that support gone, the undergraduate institutions can only become weaker, and surely will not be able to provide the quality of education the country's welfare demands.

▶ In graduate education, the problem is especially severe in engineering and computer science. Because of the draw of the market, graduates with a B.S. in engineering are going directly to business or industry rather than entering doctoral programs. Our supply of researchers in those fields, and of professors who can teach the next generation of engineers and computer scientists, is rapidly being depleted. Institutions have responded in two ways: Engineering schools and computer-science departments are restricting admission, in spite of the national shortage, and they are depending more and more on foreign instructors and graduate students. It is ironic that America, which thinks of itself as the world's leading technological power, must import engineering instructors for its schools. It is even more ironic that it is spending its dwindling resources to support foreign graduate students in the science and engineering fields. While countries such as Iran, Japan, and Saudi Arabia use their resources to educate students at the precollege level, the United States neglects the science education of its students and makes an investment in the graduate education of foreign students.

Even if we had better-prepared teachers in our schools and colleges, we would still be in trouble, for the support system that has enabled teachers to keep abreast of developments in their fields is disappearing. Their institutions have archaic equipment that is in disrepair, and can't afford to replace it. More and more, science education is "textbookish" and badly out of date, for the schools cannot pay for the supplemental materials that can enliven and update instruction. The withdrawal of federal support for our schools, colleges, and public libraries means that essential elements of the educational enterprise, so vital to good teaching, will be weakened. Out-of-school learning experiences are diminishing, too, because of the lack of federal support for science museums and for the production of science television programs.

Such examples make it clear that we have already identified the problems and know what is wrong. As a country, we need to get on with the job right now of strengthening our science-education enterprise. We have tried-and-true mechanisms for dealing with some of the problems, and there is an abundance of new ideas for addressing others. What seems to be in short supply is the will to implement them. The National Science Foundation must increase its support of essential programs in engineering, mathematics, and science education. We must not lose momentum—the country cannot afford it.

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THE MACNEIL-LEHRER REPORT

Science and Math Education

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THE MacNEIL-LEHRER REPORT **Air Date:** February 9, 1983

Science and Math Education

ROBERT MacNEIL: Good evening. The Secretary of Education, Terrel Bell, warned today that the United States could sink to second-rate power status unless it gave higher priority to math and science education. The Secretary was speaking to a group of science educators in Washington on the need to improve science and math teaching in U.S. schools. Words like "crisis," "disaster," and "national disgrace" have been used by educators recently to describe falling math and science skills. Educators say the problem starts in elementary schools and runs straight through to university graduate programs. Many educators look back longingly to the period 25 years ago when the launching of the first Soviet Sputnik galvanized the United States into a sudden effort to improve math and science training. Now Washington has picked up the issue again. President Reagan addressed it in his State of the Union, and so did the Democrats in their response. The Reagan budget calls for $76 million in new programs. Tonight, with the Secretary of education and others, why can't Johnny add? Jim?

JIM LEHRER: Robin, the problem, appropriately enough, can be seen in a few sets of numbers — the numbers for college board examinations, the SATs. In math the average score nationally has dropped steadily from 502 in 1963 to 467 in 1982. That's attributed to a declining emphasis on math and science in high school, the numbers there being: in two thirds of the country's 17,000 school districts, only one year of math and science is required to graduate. Only one third of the high schools even offer courses in so-called high hard math like calculus. But even if that were to change, there aren't enough qualified teachers around to do the teaching. The number of qualified science teachers dropped 64% in the '70s, and of new teachers now being hired to teach math and science, less than half are considered really qualified to do so. And that brings us to the final set of numbers — the pay qualified science and math professionals can make. Last year, a beginning engineer in the private sector made $22,000 a year on average; a computer-science type, $20,000. But a new math teacher got less than $13,000 on average as a starting salary. It's those numbers that have caused the Reagan administration to form proposals to do something about the problem, and the man behind the specifics is the Secretary of Education, Terrel Bell. Mr. Secretary, how does this problem of science and math education relate to the possibility of the U.S. becoming a second-rate power?

Sec. TERREL BELL: Well, we know that technology and science and our capabilities in these areas are related to our ability to compete internationally on the economic level, and it also relates to our capacity to protect ourselves — our national preparedness — with all that's going on in that area. So, because of the emerging high-tech industries and because of the emerging new weaponry that we have in our country, it is a very critical problem related to both of those very serious concerns.

LEHRER: So there's more involved here than merely having smart kids running around, right?

Sec. BELL: I should say. There are very urgent reasons for us to do a better job in this area.

LEHRER: Mr. Secretary, you're a professional educator. You've been on all levels in government, out of government, etc. What's your analysis of what happened? What caused this enormous gap to emerge in science and math education?

Sec. BELL: Well, I think for one thing we've been so preoccupied in our country — and we hadn't ought to abandon this — with equality of opportunity and with helping the disadvantaged and those that need so much help that aren't making it in our society — and I wouldn't suggest that we abandon that commitment, but I think it's almost become an obsession. And I think because of that we've let our standards drop and school boards have allowed too many electives in the high school curriculum and haven't prescribed enough of the more tough courses. And students, especially teenagers, when you let them substitute, they will. Even if you require two years of math, if you take consumer arithmetic and remedial math you're not going to get into algebra and trig and calculus. And that's where we need to be. So even where we require the years of it, the content of what we require isn't specified by school boards. We need stronger boards that are going to take a strong stand in these positions.

LEHRER: Now, specifically, what are your proposals all about? What do you think the federal government should do about it?

Sec. BELL: Well, we feel that the first thing that ought to happen is we raise the requirements — and boards are now doing that — that we're going to have an increase in the demand for math and science teachers at the same time that we're going to have a decrease in demand where students are not now registering in high school. And with our limited resources, with the horrendous deficits that we're facing, we tried to put together a program that would target on the immediate problem. Now, the National Science Foundation, in addition to that, has a proposal that will help with the in-service training. But our proposal is to provide scholarships for persons who have baccalaureate degrees who are in teaching or are not in teaching whom we think can prepare within a year or a year and a half or as immediately as they possibly can to qualify to teach. We need a response. We need it as soon as we can get it, and so we're targeting our limited resources to provide scholarships. We hope that those will be matched by local boards and by state legislatures to provide additional funds.

LEHRER: Now, these are scholarships for people to become science and math teachers in the public schools of this country, right?

Sec. BELL: Yes.

LEHRER: Let's say that you got what you wanted. How many teachers are we talking about?

Sec. BELL: Well, if you raise the number of— if you raise the requirements nationwide for one more year of math, you'd create a demand for 34,000 additional teachers. And so— and as we're increasing those requirements, we're going to need more teachers in those areas, but we're going to need less in other areas. And also as we do that we need to realize, as you have indicated in your opening statement, that we're losing because we're not competitive. The marketplace is working against us in this regard.

LEHRER: But essentially— I don't mean to use the word "only," but essentially the only thing that the federal government plans to do, that you want done, is to focus on the high school teacher and try to get more qualified teachers teaching math and science, correct?

Sec. BELL: Well, that's most of it, but I would also point out that the National Science Foundation has some responsibilities for improvement in summer institutes and so on. But most of it is related to our proposal. And, of course, we've been strong for strengthening state and local capabilities, and we hope that— and we know now that state legislatures in session and many of them are also addressing this problem. So we wouldn't look at our effort in isolation from the others out there.

LEHRER: Would you look at your effort as a solution to the problem?

Sec. BELL: Not in isolation. I think it's going to take some reciprocal effort on the part of state and local.

LEHRER: Thank you. Robin?

MacNEIL: Now for a look at the problem from the local level, we turn to Peggy Holliday, who is the principal of the Wake Forest elementary school in Wake Forest, North Carolina. She has been a science teacher for the past 18 years. Ms. Holliday, do North Carolina schools have a math-science crisis in your view?

PEGGY HOLLIDAY: Absolutely. I believe that this is definitely a problem, that we are not unique. I feel that other states have the same kind of problem, perhaps North Carolina has been chosen by you and the people here because our state department of public instruction has statistical data on the problem.

MacNEIL: Well, how would you define the problem in North Carolina?

Ms. HOLLIDAY: The statistics will tell you that approximately 49% of the mathematics teachers in the state are inappropriately certified, and approximately 30% of the science teachers are inappropriately certified in grades seven through 12.

MacNEIL: Why is that?

Ms. HOLLIDAY: Oh, you don't make it easy.

MacNEIL: Does it simply come down to the salaries that they are offered?

Ms. HOLLIDAY: Part of that is salary. In North Carolina a beginning teacher — four years of college, coming into the teaching profession — will earn $13,000 a year. Every five years you renew your certificate by getting other courses. After 15 years of experience, if you have a master's degree, the peak that you can earn in that state is $19,600 for 10 months' employment.

MacNEIL: And if you'd spent that 15 years in private industry?

Ms. HOLLIDAY: Who knows?

MacNEIL: You said it's partly money. What else is it?

Ms. HOLLIDAY: It's prestige. It's dedication. It's lots of different things — none of the things that money alone is going to fix. The public— the general public, in my opinion, gets what they expect out of education, probably more.

MacNEIL: Is that prestige applied to teachers of all subjects, or is it particularly low at the moment concerning math and science teachers?

Ms. HOLLIDAY: I think it would be generally all teachers. There is an undercurrent type of affair that if you can't do anything else you can teach. And I think that's sad because it takes a very unique individual, a hard-working individual. Math and science teachers that have stuck with it, that are good, that are there with the kids and are teaching, are addicted. They have chalk dust in their blood.

MacNEIL: You heard what the Secretary said. Part of the need to remedy this is for local school boards to be stronger and insist on tougher curricula in the schools. Does that make sense to you?

Ms. HOLLIDAY: Surely. For some children. But then you've got a mass of population; not all children can take calculus, not all children can take the advanced sciences. You have to take them as far as you can possibly take them — teach them as much as you can teach them, and try not to stymie their imaginations.

MacNEIL: Well, in your own experience, why hasn't that been done over the past few years?

Ms. HOLLIDAY: In my own experience— I don't know how to answer your question.

MacNEIL: Well, you heard the Secretary say that society has kind of been taking the easy way out because it wanted to increase opportunities for less advantaged people, and its standards had slipped as a result of that. Does your experience fit that?

Ms. HOLLIDAY: In part that may be true. I don't think that's— I don't think that's totally the answer, in all due respect to our Secretary. But you have lots of equipment supplies. You have materials. You have resources. In our state, teachers are handed textbook and chalk, and beyond that it's a fight to see how much materials, how many resources that you can actually get into those classrooms.

MacNEIL: What would you need nowadays to teach science adequately that you don't have?

Ms. HOLLIDAY: The high schools in our county would be doing back flips if the chemistry students could have access to a Spec-20.

MacNEIL: What's that?

Ms. HOLLIDAY: A piece of equipment that's used in the field of chemistry that's outmoded — outdated, all but obsolete, and just virtually isn't ordered by anybody else anymore. There are many high schools, and I'm sure we're not alone in this — they don't have basic pieces of equipment simply because the equipment is just simply not to be had because of the funds.

MacNEIL: What do you think of the remedy the Reagan administration has proposed? You've just heard the Secretary describe it.

Ms. HOLLIDAY: It's better than nothing. We'll take every penny we can possibly get to upgrade teachers in any way, whether it means sending them back to school, whether it means in-service programs in which they come in weeks at a time or after-school types of affair. Anything that we can get is better than what we currently have. Personally, I'd like to see a swing back to the '50s-type of programs in which we had a concentration of subject matter. Teachers who have strong backgrounds in their subject areas have got to feel more competent. They feel more comfortable before the classroom. And when a child will ask a question that can lead you into the world of visuals and abstracts and the beautiful questions that you can see their minds turn over, that's when— that's when you need that competence—

MacNEIL: Superior qualifications?

Ms. HOLLIDAY: You need that superior qualification. There's no way that any teacher will ever teach all the kids everything they know — not a competent teacher. But to have that background and that security to know and see the insight that the child is having, that's one of the joys— that's one of the things that keeps you in teaching.

MacNEIL: Well, thank you. Jim?

LEHRER: An elaborate study of the American high school is now underway, a study that includes a hard look at what's happening in the teaching of math and science. The Carnegie Foundation for the Advancement of Teaching is conducting the study, and the Foundation's president is Ernest Boyer, the former chancellor to the State University of New York and the U.S. Commissioner of Education in the Carter administration. Dr. Boyer, do the results of your study thus far bear out the crisis label when it comes to science and math education?

ERNEST BOYER: Yes, without question. We studied schools from coast to coast, and I'm convinced the Secretary's description of the problem is absolutely correct.

LEHRER: Based on what you've seen thus far in your study, what fact or group of facts disturbs you the most?

Dr. BOYER: Well, at the heart of the problem is the crisis in teaching, which has been the centerpiece of our discussion. I think we're facing a collapse of the teaching profession, and there's no way that we can have excellence in teaching without excellence in the classroom, and that has to be our number-one priority.

LEHRER: Do you think the Bell-Reagan approach is the right one — to put the emphasis on the high school teacher, as Secretary Bell outlined?

Dr. BOYER: I think it's missing the basic problem. The question before us is, why have the math and science teachers left in the first place? And drawing an analogy from our roads and bridges, I think we have an infrastructure problem in American education. And, while I respect very much Secretary Bell and his leadership, I think this is almost a token in relation to the problems that lie behind the crisis we face. Let me note just three. The problem of science and math excellence begins in the earliest grades, and currently only an hour and a half per week is devoted to the teaching of science.

LEHRER: You mean in elementary schools?

Dr. BOYER: In the elementary schools. The issue of getting more science and math teachers in the upper grades will, I think, be futile if these people then spend their time on remedial education. The latest national test scores show that in the last 10 years our high-achieving students have continued to decline in the 4th, 7th and 11th grades. So the educational problem we face, a tough one, is absolute standards in the earliest years. Number two: our problem has to do with working conditions. I was struck by the comment of the teacher. This verifies absolutely a thing that is heartbreaking. Only one percent of the total school budget in the United States is devoted to equipment and supplies. And a survey last year showed that 60% of all the high schools are cutting their science equipment budget this year, and it's already abysmally low. We met a high school teacher who said he had not one dime for school— for laboratory equipment. And another teacher told us that he couldn't put together one experiment because of broken pulleys, broken test tubes, broken beakers. Now, I ask you how we can carry on excellence in science and mathematics when these teachers have to beg and patch to get what would be minimum equipment. Third, the rewards of teaching, as you've just heard, have absolutely dropped. The recognitions are not there, to say nothing of salaries. Interestingly, the data show that teachers are twice as interested in what we call psychic gains than they are even in the salary question — the gap you've mentioned. More than that, they don't have the continuing education. Our survey showed that about 40% of all the teachers in high school science have not had a serious course to enrich their education in their 15 years of average teaching.

LEHRER: And of course science is where things are moving and changing more than anything.

Dr. BOYER: This is in a field where in 15 years you're not only obsolete, you're probably a quack in what you're teaching. So unless we build into the school system continued education, we're going to be teaching obsolescence.

LEHRER: Sounds to me, Dr. Boyer, what you're outlining is another crash program back to the Sputnik situation in the '60s.

Dr. BOYER: I don't think there's any way to avoid that, and my quarrel with Secretary Bell — I respect him very much — is that I'm afraid we're going to be recruiting and bringing in teachers who then, discovering these conditions, if we can get them, will simply drop out again. In fact, 24% of all the science teachers today say that they plan to leave. So it's not just adding to the new enrollments. It's recognizing that even those who are in the schools — underqualified, as we've just heard — are going to leave. I think we are going to have to give this an investment that goes far beyond the proposal we have today.

LEHRER: Thank you. Robin?

MacNEIL: One man who has done a lot of science teaching, at least to the American public, in recent years is Carl Sagan, lecturer, author and professor of astronomy and space at Cornell University, also host of the PBS-TV series, Cosmos. Dr. Sagan, do you agree there's a crisis?

CARL SAGAN: Absolutely. I think the United States has been behaving as if it doesn't think it has a future. It's certainly a crisis.

MacNEIL: What does that mean — it doesn't think it has a future?

Dr. SAGAN: Well, the problems— we have problems today; we will have problems tomorrow. It is very clear that by the beginning of the 21st century the United States and the planet Earth will have a set of extremely difficult problems — inadvertent climate modification, exhaustion of fossile fuels and mineral resources—

MacNEIL: You mean, quite apart from competitiveness in industry or in military hardware.

Dr. SAGAN: That's correct. Just the set of global crises which are facing us, whatever the source of the crisis, can only have a solution which involves science and technology. If we are not preparing a base of scientifically trained people — and I don't just mean the scientists, but the American public *in toto* — as being comfortable with science, as being able to make intelligent decisions, being able to elect legislators who understand science, then we are in for the most serious problems.

MacNEIL: For the United States as a nation, what are the consequences of this failure in science education?

Dr. SAGAN: Well, as several people have said, clearly new initiatives in industry and technology in a world which is changing very rapidly, the United States will continue to fall behind, as it has been for— to take one example, in Japan there is a multi-billion-dollar consortium of universities, business and the government in field robotics, which is making enormous progress. They are world class. And the United States is running along afterwards at still a very sluggish rate. And that is true in a dozen other key technologies where the United States in fact may have made the original innovations but is not exploiting them.

MacNEIL: How do you view the Reagan program as outlined by the Secretary?

Dr. SAGAN: Well, as several people said, every little bit helps, but it clearly is not adequate in scale or scope for the seriousness of the problem which faces us, and there are all sorts of areas that it doesn't address at all. For example, improving the climate of science receptiveness in elementary schools or public education apart from the school system.

MacNEIL: You wrote in an article recently that scientists had a negative image in the American mind now. Why is that, do you think?

Dr. SAGAN: Well, give you an example. Saturday morning cartoon program for children. A scientist who is clearly a moral cripple discovers that there is an energy crisis. His solution is to develop a ray which will shrink everybody down to that size so they'll eat less and use less energy. The superhero saves the day, stopping the scientist and explaining to him that in a democracy you have to get permission of people to shrink them down to one-inch size. What little children watching this program learn is that scientists can't be trusted, that they are dangerous and probably a good thing to stay away from science yourself. What is needed is exactly the opposite — an encouragement of scientific attitudes of thought, which after all is what human beings are good at. There is nobody else on the planet besides humans who does science. It's the secret of our success in some respect.

MacNEIL: Thank you. Jim?

LEHRER: Well, obviously, Mr. Secretary, we can't blame the Reagan administration for the cartoon, but everybody agrees with your analysis of what the problem is, but everybody also agrees that what you're proposing is a drop in the bucket and it isn't really going to make that much difference. How do you respond to these three people?

Sec. BELL: Well, we think it's going to make a significant difference. We don't allege that it's going to solve the problem.

LEHRER: But what is, Mr. Secretary? They keep saying the problem is so big, and you're proposing so little.

Sec. BELL: Sure. I think we ought to back up and ask ourselves whose responsibility is it? And education is to the states what national defense is to the federal government. And what we'd ought to do and what we're proposing to do is work in partnership with them. This is a block grant; it's a stimulus to work with the states on it, and I would indicate that the states don't have a deaf ear to this. Look at what's being proposed. Look what happened in the state of Mississippi. I know what the governor of North Carolina has just proposed for education there. The states are onto this problem. Legislatures are in session. So I'd say we need to look at all of it, and also I'd emphasize that I haven't had an opportunity to talk about what the National Science Foundation is proposing to do. It is to some extent responsive to this, but I'd just conclude by saying we don't propose that on the federal level that we grab this problem and solve it in isolation from the state and local entities.

LEHRER: Ms. Holliday, do you think they should?

Ms. HOLLIDAY: I think that perhaps they should. I think that where the states have control of education and the nation has control of defense, I think that the nation must be defended by Americans and Americans are made up of those people in 50 states. And we cannot educate scientists in North Carolina to serve only North Carolina and those in Virginia to serve only Virginia and across the country. Somebody, some group of people in this nation have got to be farsighted enough to find some direction, to seek a solution, and have the guts enough to stand by it and commit to it.

LEHRER: Do you agree with that, Dr. Boyer?

Dr. BOYER: Yes, I do. The current budget has a $30-billion increase for defense, and if I hear the Secretary correctly, quite properly the human equation of this is training the next generation in the public schools. I don't mean that education is clearly geared only for security, but I only throw that figure in as an illustration of priority, and I think the proposed $70 million— if the federal government by that action signifies they have a role, then I believe that role should be of a greater level of investment.

LEHRER: Carl Sagan, if you were running things in the federal government in Washington, what would you do to solve this problem?

Dr. SAGAN: Well—

LEHRER: Compared with what Dr. Bell and Mr. Reagan have proposed.

Dr. SAGAN: Well, I mean, it is true that there is a recently discovered concern in the Reagan administration about science. The NSF education budget was, however, severely cut in the first two fiscal years of the Reagan administration budget. I was amazed to hear Secretary Bell suggest that the reason there's been a decline in science education is because there have been social programs over the last 20 or 30 years. I'd be very interested to know what his sense is about military programs which pull first-rate scientists away from open and free inquiry and lock them away in a classified context. If I had anything to say about public education and science, I would like to see organizations like the National Science Foundation have significantly more funds for teacher training, for the training of students, for the encouragement of elementary-school science education, and for a massive program of making science fun and palatable, which it certainly is, for the general public, using mass media.

LEHRER: We have to go.

MacNEIL: Mr. Secretary, Dr. Boyer, thank you for joining us in Washington, and Ms. Holliday, Dr. Sagan, in New York. Good night, Jim.

LEHRER: Good night, Robin.

MacNEIL: That's all for tonight. We will be back tomorrow night. I'm Robert MacNeil. Good night.

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A NEW PERSPECTIVE ON MATH AND SCIENCE EDUCATION

MOST OF THE reports on education that have been receiving such widespread attention are quite grim, particularly in their conclusions about the state of mathematics and science education in U.S. public schools. Although *A Nation at Risk* acknowledges the success of our schools in graduating nearly 75% of our young people from high school and enrolling nearly half in college, it nevertheless concludes, "Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world."[1]

Not all observers of education have been so pessimistic. But most have agreed that mathematics and science education in the U.S. are deficient in at least five respects:

1. The U.S. system of education is not producing trained scientists, mathematicians, engineers, and computer scientists in numbers sufficient to meet economic and military needs.
2. The problems will become even more severe in the next decade, when technological advances will increase the need for highly trained personnel in these fields.
3. U.S. students are less well trained, as measured by their test scores, than are their peers in other industrialized countries.
4. U.S. students today are less well trained than were their predecessors.
5. These problems result from a general laxity in educational standards and from a shortage of qualified science and mathematics teachers.

I will discuss here the extent to which these conclusions are supported by research findings. I will then describe the tradeoffs in curriculum, school finance, and social opportunity that should be considered before implementing solutions to these perceived problems.

Research Findings

1. *Is the U.S. system of education producing adequate numbers of trained scientists, mathematicians, engineers, and computer scientists to meet economic and military needs?* Consider some recent findings of the Bureau of Labor Statistics (BLS) and other organizations.[2] These figures show that the current supply of scientists and mathematicians is adequate, except in a few subfields of physical and biological science. Indeed, projections indicate that by 1990 the number of new science and mathematics graduates at all degree levels will *exceed* the number able to find jobs in those fields.

The projections also show an overall balance between supply and demand for engineers for the rest of the 1980s. The shortage of engineers that has received so much public attention in the past few years has been limited to a few specialties – electronics, computer design, and petroleum engineering – and certainly does not justify massive efforts to change

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openings for engineers, and 418,000 new openings for engineering and science technicians.[8] Probably more surprising is the prediction that the number of new kindergarten and elementary teaching positions (511,000) will be greater than the number of positions for computer systems analysts and for computer programmers *combined* – and not substantially lower than the total number of new openings for engineers.

Compare these numbers with the results of a survey of freshmen entering college in 1983: 3.1% of these students planned to become elementary school teachers; 10.8% planned to become engineers; 8.5% planned to become computer programmers or analysts.[9] Interest in computer fields among college-bound seniors taking the SAT is more than three times greater today than in 1979 and more than six times greater than in 1975.[10]

Just as important, it is not at all certain that the technological innovations of the next 10 to 20 years will require higher levels of skill.[11] Some economists argue that high technology is more likely to reduce the skill requirements of jobs than to increase them and that the supply of technically trained personnel will outstrip the demand for their skills. This conclusion is contrary to the popular assumption that we can expect shortages of qualified scientists and engineers.

Computers offer one example of potential reduction in skill requirements.[12] Before recent advances in computer technology, programmers and operators needed many complex skills to use computers. Now the creative and skilled work is done by systems analysts, packaged programs are readily available, and programming and operating a computer have become routine tasks. The drop in prices of home computers also argues against the ever-increasing need for a high-cost labor force to develop and produce these machines.

I do not mean to suggest by all of this evidence that our society will not need significant numbers of highly trained scientists, engineers, and computer specialists. We clearly need such specialists. However, reports of shortages, poor training, and the proportion of total employment accounted for by these fields have been greatly exaggerated.

3. *Are U.S. students less well trained in science and mathematics (as measured by achievement test scores) than their peers in other industrialized countries?* I doubt it. The *average* high school student enrolled in the U.S. scores lower in international comparisons than the *average* high school student enrolled in other industrialized countries. But these comparisons do not compare equal proportions of the high school age groups. In Europe, academic schooling for those between ages 16 and 18, while perhaps not elitist, certainly does not attempt to serve virtually the entire age group. Only about 20% of the high-school-age children in Europe attend upper-secondary school – the highest-achieving 20%. About 80% of that age group in the U.S. attend high school. Consequently, international studies of achievement often compare the average score of more than three-fourths of the age group in the U.S. with the average score of the top 9% in West Germany, the top 13% in the Netherlands, or only the top 45% in Sweden.

However, when the same proportions of relevant age groups are compared, the results are quite different. Top U.S. students score at about the same level in mathematics as comparable groups in many other industrialized countries, though they still score lower than their peers in Sweden, Japan, and Israel. Top U.S. students also score at about the same levels in science as students in other industrialized countries – better than students in France, Belgium, and Italy; not as well as students in New Zealand, England, and Australia.[13] I could go on, but it is sufficient to note that, when equal proportions of age groups are compared, the results do not reflect badly on the U.S. system of education. This is especially true in light of the fact that U.S. schools not only provide an education of high quality for the brightest students but, unlike their counterparts abroad, must do so in a school environment that includes virtually the entire age group, often working together in the same classroom.

4. *Are U.S. students today less well trained in science and mathematics (as measured by test scores) than were their predecessors?* The achievement test scores of students who are likely to major in science or mathematics have remained high in these areas. Declines are more evident in tests that assess the basic scientific and mathematical knowledge of the general population.

Scores on College Board science achievement tests in biology, physics, and chemistry, taken by the top students among the college-bound population, are as high as or higher than they were in the early 1970s. The same is true of mathematics achievement test scores.[14] In addition, scores on College Board Advanced Placement tests in science and mathematics were at least as high in 1983 as they were in 1973, despite increased numbers of students taking the tests.[15] Achievement test scores on the Graduate Record Examinations (GRE) show mixed results over the past nine years. Mathematics scores have gone up; physics scores have gone down; engineering scores have remained steady.[16]

The widely reported declines in test scores are based on tests administered to a broad cross section of the population. Even here results are mixed. The National Assessment of Educational Progress (NAEP), which assesses representative samples of elementary and secondary students, shows that 9-year-olds have scored at about the same level in science since the 1972-73 science assessment, while scores for 13- and 17-year-olds have declined.[17] During roughly the same period, mathematics scores have stayed about the same for 9-year-olds, improved for 13-year-olds, and declined for 17-year-olds.[18]

The scores of college-bound students on the American College Testing (ACT) Program natural science examination (a broader cross section of students than those who take the College Board achievement tests) have remained approximately the same since the mid-1970s.[19] Mathematics scores for college-bound students on both the ACT exam and the Scholastic Aptitude Test (SAT) declined from the late 1960s to the mid-1970s, when they began to level off. ACT math scores show some evidence of continuing decline, while SAT math scores have remained essentially the same for the past six years.[20] Finally, scores of graduate school applicants on the quantitative portion of the GRE are higher now than they were in the early 1970s.[21]

When interpreting the results of all of these tests, it is most important to remember that changes in the populations taking the test have a great deal to do with changes in the scores. The ACT Program notes that "small changes in average scores can result from a variety of factors, the most notable being changes in the demographic characteristics of the students taking the tests."[22] An advisory panel on SAT scores noted that as much as three-fourths of the decline in scores between 1963 and 1970 can be attributed to changes in the numbers and socioeconomic characteristics of students taking the test, and one-fourth of the decline after 1970 can be accounted for by continuing demographic shifts.[23] Moreover, these changes have nothing to do with the quality of education, and changes in test scores that can be attributed to population changes are certainly unreliable measures of the quality of education.

5. *Is there a general laxity of educational standards and a shortage of qualified science and mathematics teachers?* The actual data show that recent reports exaggerate or inadequately define both problems.

Contrary to public perception, high school students took more mathematics in 1980 than they did in 1972 and about the same amount of science.[24] Among college-bound students who took the SAT, the amount of academic coursework has *increased* over the past six years, with the largest increases occurring in mathematics and the physical sciences. There has also been greater enrollment in advanced, accelerated, and honors courses.[25]

Turning to the supply of qualified teachers, the well-publicized shortage of secondary school mathematics and science teachers has not reached serious proportions nationwide. Severe shortages may exist in certain parts of the U.S., but adequate data are not available to assess the extent of the problem. The shortages are expected to become more serious in the future because of increased high school graduation requirements and decreased enrollment in teacher education programs in mathematics and science. However, these factors will be offset somewhat by declining secondary school enrollments.[26]

Before enacting any proposed remedies for the projected shortages of science and mathematics teachers, such as extra pay or loan forgiveness programs, policy makers should consider several factors. First, teacher shortages are not limited to math and science. There are also shortages in special education and in vocational/technical fields.[27] Second, reported teacher shortages result at least partly from factors other than the unavailability of qualified math and science teachers. Budgetary constraints and an oversupply of teachers in other fields compound the problem of measuring the extent of the shortage of math and science teachers. For example, out-of-field teaching, which is used as one measure of teacher shortages, often reflects the placement of surplus teachers of other subjects who cannot be laid off because of their seniority. (Many school systems are expected to respond in this way to increased graduation requirements in mathematics and science.) Indeed, out-of-field teaching occurs even in fields with teacher surpluses, when declining enrollments force schools to staff their classrooms with the most senior teachers. A North Carolina study, for example, found that out-of-field teaching in English occurred 60% as often as it did in math.

Third, shortages of math and science teachers do not necessarily mean that these teachers can readily find jobs. For example, the state of Kentucky offered financial incentives for persons to enter teacher training programs in mathematics and science and then found that few available teaching positions existed for the first graduates. And in April 1983 – the month in which the National Commission on Excellence in Education released its report, noting "particularly severe" shortages of mathematics and science teachers – the Chicago press reported that the Chicago Board of Education had made substantial reductions in the number of math and science teachers during the past several years. Indeed, Chicago had a surplus of math and science teachers. Many of these teachers were working as substitutes and not necessarily in their fields of expertise. More often than not, such problems arise as a result of financial strain on states and school districts. It is not so much that the teachers aren't needed as that the districts can't afford to hire them.

Other Considerations

The foregoing discussion suggests that recent reports tend to overstate or inadequately define the problems in mathematics and science education. Not unexpectedly, some of the proposed reforms derive from questionable assumptions about the nature of the problem and pay little attention to the overall implications for public policy.

An example may be useful. Many of the reports base their recommendations on the assumption – quite unsupported by research – that the U.S. educational system is not producing adequate numbers of highly qualified scientists, engineers, mathematicians, and computer specialists. These reports stress increasing requirements, so that all students must take more algebra, physics, or chemistry. However, the problem is quite different: the population in general is not well-informed about basic scientific issues or about how to perform simple mathematical applications, such as problem solving. The problem is not the number or quality of those trained to be scientists. The emphasis of the reports on increasing requirements for traditional science and math courses does little to improve the education of the large majority of students who might benefit more from curricula that are not designed along narrow disciplinary lines.

Bill Aldridge, executive director of the National Science Teachers Association, put it this way:

> High school science and math courses present content that largely duplicates content offered in college courses. These high school courses offer little more than preparation for that next course which the vast majority of students will never take. Present proposals to increase graduation requirements in science and math will force all students either to take these courses or drop out of school.

Traditional courses often amount to little more than the students repeating chemical terms and formulas without understanding what they are learning or how it is relevant to the world around them. The result, which most of us know from our own experience or from that of our children, is that most students memorize a lot of material. But they cannot place it in context, understand the fields from which the material is derived, or explain how it is used. What they memorize is usually forgotten within a short time. Perhaps it would be more productive for students to understand scientific methodology and scientific issues that impinge on public policy, rather than to attempt to learn everything that is known about physics in one school year.

As Lee Shulman noted, "Forcing students to take the same chemistry or algebra II they have been avoiding for the last 20 years is no answer." Irving Spitzberg, general secretary of the American Association of University Professors, summed it up this way: "Requiring courses does not guarantee learning in courses." The

French essayist Montaigne, in 1580, best reflected my concerns:

> But as the steps that we take walking in a gallery may tire us less than if they were taken on a fixed journey, so our lessons, occurring as if it were accidentally, without being bound to time or place, and mingling with all our other actions, will glide past unnoticed.[35]

In addition to proposing reforms that may not be based on solid evidence or a careful analysis of the problem, the reports generally overlook the implications of their recommendations for other parts of the curriculum. With notable exceptions, such as Ernest Boyer's study,[36] problems in mathematics and science education have received more attention than problems in other fields.

But other areas of the curriculum are in need of improvement at least as much as mathematics and science. SAT scores, for example, have shown greater declines in verbal than in math scores.[37] ACT social studies scores have declined, while science results are at least as high as they were in previous years.[38] Although the NAEP scores did not show a decline in the basic reading skills of 17-year-olds between 1970 and 1980, they did show a decline in students' ability to draw inferences from the material they read.[39] The quality of students' writing leaves much to be desired, and recent observers suggest that a simple writing requirement is more critically needed than improved science and mathematics instruction.[40] A number of engineering schools are now revising their curricula to include broader liberal arts courses.[41] Moreover, recent surveys of academic officials found that the humanities are losing many of the highest-achieving students to the sciences and engineering.[42]

In a widely reprinted article based on his recent conversations with high school and college students in the Los Angeles area, Benjamin Stein put the "problem" we face in some perspective.[43]

> [A] student at [the University of Southern California] did not have any clear idea when World War II was fought. She believed it was some time this century. . . . She also had no clear notion of what had begun the war for the United States. ("Pearl Harbor? Was that when the United States dropped the atom bomb on Hiroshima?") Even more astounding, she was not sure which side Russia was on and whether Germany was on our side or against us. . . .
>
> A few [students] have known how many U.S. senators California has, but none has known how many Nevada or Oregon has. ("Really? Even though they're so small?") . . .
>
> Of the teenagers with whom I work, none had ever heard of Vladimir Ilyich Lenin. Only one could identify Joseph Stalin. (My favorite answer – "He was President just before Roosevelt.") . . .
>
> None [of the students] could name even one of the first 10 Amendments to the Constitution or connect them with the Bill of Rights. . . .
>
> Only a few could articulate in any way at all why life in a free country is different from life in an un-free country. . . .
>
> I have mixed up episodes of ignorance of facts with ignorance of concepts because it seems to me that there is a connection. If a student has no idea when World War II was and who the combatants were and what they fought over, that same human being is likely to be ignorant of just what this society stands for. If a young woman has never heard of the Bill of Rights, that young woman is unlikely to understand why this is a uniquely privileged nation with uniquely privileged citizens. . . .

There are other considerations in determining whether or how education reforms should be implemented. Few of the recent studies of education consider the financial or social costs of their recommendations and the tradeoffs that would be required.[44] But money spent on a minor problem often uses resources that might better be spent on other, more pressing requirements. Similarly, reforms that do not consider implications for all parts of the society are likely to raise more problems than they solve. Two illustrations suggest the kinds of issues that need to be addressed.

Harold Howe estimates that the total cost of recommendations in recent education reports would be $20 billion to $30 billion in new funds *each year*.[45] To put this figure in perspective, the total federal expenditure for elementary, secondary, and higher education programs in fiscal year 1983, including student aid at the college level, was $15.4 billion. But aside from their prohibitive cost, each of the recommendations in the reform reports is fraught with controversy. How would meritorious teaching be measured? Who would decide? How would the recommendations be financed and from which sectors of our society? The recent education reports pay little attention to these issues.

Although some of these reports give a passing nod to the impressive role of the U.S. educational system in increasing social opportunity, they do not discuss the implications of such recommendations as stricter course and graduation requirements. For example, how will requiring algebra II or physics affect dropout rates, tracking, or the future employment prospects of students who fail? We cannot pretend any more to be a classless society, but we certainly do not wish to create an educational system that will put unnecessary roadblocks in the path of those who begin life with the fewest advantages. As a society, we are not content to educate only the top 10% to run the nation or its business. Moreover, there is no evidence that the brightest students are at a disadvantage in fulfilling their academic potential.

The recent discussion of education reform, prompted in part by romantic notions about future technology, has not been conducive to a careful consideration of the implications of the proposed changes. We must define precisely the problems we wish to solve and consider the broad implications of our solutions. Or else, in our rush to meet the putative demands of the future, we may neglect the students and issues most in need of attention.

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BOOKS

When Words Are the Enemy

Illiterate America. By Jonathan Kozol. 270 pages. Anchor/Doubleday.

Here's another social problem you probably didn't know we have. According to Jonathan Kozol's calculations, at least one-third of all adults now living in America are either illiterate or nearly so—they cannot function competently in our society. In broad terms, that means that 60 million American adults are "substantially excluded from the democratic process and the ordinary commerce of a print society." More concretely, these people can't look up a telephone number or read the warning on a can of Drano; they can't count their change, puzzle out a lease or shop efficiently at a supermarket. Unlike most injured minorities, they can't express themselves effectively in ways that might bring about change. Unlike most minorities, illiterates can "pass" for a while undetected in the larger society. Such is the humiliation attending illiteracy that many will go to great lengths to avoid detection.

The figures Kozol offers from official sources are staggering. In Boston, 40 percent of adults are illiterate; among black adults nationwide, the rate is 44 percent; the United States ranks 49th in literacy levels among 158 U.N. countries. What's more, Kozol says, the problem is getting worse. Ironically, as our society edges away from print as its primary means of communication, the reading level required to get a job increases: the maintenance manuals for all those cruise missiles and computers we hold so dear are many and complex.

Activist: Why should anyone capable of reading NEWSWEEK concern himself with this? The disability isn't contagious; it can't affect us as herpes or toxic waste or the national debt can. Kozol, author of "Death at an Early Age" and a radical activist in education since the '60s, offers several reasons. One is moral: to arrive at "equity and justice, respite from grief, relief from needless fear." The illiterate, he says, is crippled in three ways: by his exclusion from society and commerce; by his ignorance of the past, which helps explain his condition, and by his inability to express his dilemma through writing. This appalling incidence of illiteracy, he argues, is not something people bring on themselves. It *is* self-perpetuating: not through genetic deficiency, as racists say, but because illiterate parents can't prepare their children for school by reading to them, can't argue for reform of the schools, which fail to educate their children. Nor is illiteracy an accident. Too many politicians, Kozol believes, are pleased that these people don't express themselves in politics.

Another reason Kozol offers for attacking the problem is economic. By juggling his figures, he suggests that illiteracy costs us $20 billion a year in industrial and tax expenditures. Are we still unmoved? Kozol offers a third: suppose the next plane you take is serviced by a man who can't quite understand his manual?

Make no mistake: "Illiterate America" is not a book of social reporting, it's an editorial, a call to arms. "We need an all-out literacy war in the United States," writes Kozol. What's more, he tells us how to do it. First, you don't let the government or the university set aside money for further study; you can always get money for research, none to act upon what we already know. Given $10 billion a year for 10 years, Kozol believes, we could reduce by half the adult illiterates in this country. Of course he won't get $10 billion—Kozol claims the Reagan administration is trying to reduce the $1.65 per person it allocates to the problem now—so he must begin with a grassroots movement that will prove so success-

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ful the federal government must respond. He wants volunteers who live in the communities where illiterates live. He wants students and the elderly involved as teachers; he wants publishers to donate hundreds of thousands of books. He wants to teach people to read with materials meaningful to them—through oral histories which they can learn to transcribe, keep and share with their children. Literacy, he writes, represents "some sort of answer to a universal need for vindication and for self-perpetuation."

'Mobilization': The age of pamphleteering is long past and Kozol is certainly no Tom Paine. His book is rangy and repetitive, perhaps twice too long, but he leaves no doubt at the end about what he thinks, or about what he thinks can be done. Throughout the conservative '80s, Kozol has kept his fires stoked, though the fervor with which he presses his case may be impolitic: "It *will* be an upheaval," he writes. "It will be a massive mobilization. If we conceive it as anything else, it cannot be successful." It will also be political: the newly literate will learn to express their anger. They may not put up with our incursions in Latin America, our fondness for the arms race. Such rhetoric may not be the way to gain the support of those who control the money. Even on a smaller scale, Kozol seems to seek out opposition. The cant phrase "back to basics" in education, he insists, is "an unsubtle euphemism for a retrogression into basic privileged reward for few and basic heartlessness toward those who are denied the means of access."

Can Kozol's plan work? It *can*; the question is: will it work? Will enough people listen? Kozol's idealism is tempered by two decades of experience. He knows how hard it is to raise concern for unfortunates who lack a constituency, even a charismatic leader. He knows that most of us would rather not hear his news, his call to action.

PETER S. PRESCOTT

NEWSWEEK/MARCH 11, 1985

The Rising Tide of Illiteracy

ILLITERATE AMERICA
By Jonathan Kozol
Anchor Press/Doubleday. 270 pp.

By Neil Postman

WHATEVER ELSE may be said of the immigrants who settled in New England in the 17th century, it is a paramount fact that they were dedicated and skillful readers. Although colonial literacy rates are difficult to assess, there is sufficient evidence that between 1640 and 1700, the literacy rate for men in Massachusetts and Connecticut was somewhere between 89 and 95 percent. They represented, quite probably, the highest concentration of literate males to be found anywhere in the world at that time. (The literacy rate for women in these colonies is estimated to have run as high as 62 percent.)

It is to be understood that the Bible was the central reading matter in all households, for these people were Protestants who shared Luther's belief that printing was "God's highest and extremest act of Grace, whereby the business of the Gospel is driven forward." But reading for God's sake was not their sole motivation in bringing books into their homes. For example, between 1682 and 1685, Boston's leading bookseller imported 3,421 books from *one* English dealer, most of these non-religious books. The meaning of this fact may be fully appreciated when one considers that these books were intended for consumption by approximately 75,000 people then living in the northern colonies. In the year 1772, Jacob Duche wrote: "The poorest labourer upon the shore of the Delaware thinks himself entitled to deliver his sentiment in matters of religion or politics with as much freedom as the gentleman scholar. . . . Such is the prevailing taste for books of every kind, that almost every man is a reader." Four years later, Thomas Paine's *Common Sense* was published, and within a year almost 500,000 copies were in print. In 1985, a book would have to sell 24 million copies to match the proportion of the population Paine's book attracted. America's founders, in other words, were as committed to the printed word as any group of people who have ever lived.

Our situation today is somewhat different. According to Jonathan Kozol, one out of every three Americans is incapable of reading his book, *Illiterate America*. In Boston, 40 percent of the adult population is illiterate. In San Antonio, 152,000 adults have been documented as illiterate; there are probably many more. One million teenagers between 12 and 17 cannot read above the

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third grade level. The United States ranks 49th among 158 member nations of the U.N. in its literacy levels.

WHAT HAPPENED? Well, for one thing, the electric plug. But Kozol does not dwell upon this. Neither does he explore very deeply some of the obvious other reasons why the leading nation of the "free world" should presently be crippled by 60 million illiterates. He is rather concerned about the *fact* of widespread illiteracy, its human and social costs, and what can be done about it. And, I dare say, anyone reading his book will, at the end, be persuaded that illiterate America poses a more immediate and dangerous threat to our social and political lives than the Sandinistas, Russian subs or, possibly, acid rain. For Kozol has written his best book since *Death at an Early Age*. Whereas his more recent work has been burdened by an excess of moral indignation, here Kozol allows the outrages of illiteracy to speak for themselves. He guides us through the "hard facts" of the problem with the discipline and sureness of one who has spent seven years studying the figures. But his strongest point—indeed, his most worthy gift—is his capacity to reconstruct in poignant narratives the pain and humiliation of those who are illiterate: people who cannot read the instructions on a bottle of prescription medicine, cannot read the letters that their children bring home from their teachers, cannot read the waivers they sign preceding surgery.

"According to Jonathan Kozol, one out of every three Americans is incapable of reading his book."

Having stated the problem, Kozol proceeds to offer a series of solutions, which, taken together, amount to a massive community and government effort to rid our schools, voting booths and work places of illiteracy. And he takes the time not only to give the details of how this can be done but also to describe cases where, in miniature scale, it is being done.

It is good to have Jonathan Kozol back again with a book that must be read. For Kozol is what we Americans mean when we talk of our "best and brightest." His voice is inspired by commitment. He knows humbug when he hears it, which is to say, he knows the difference between a fact and an ideological cliché. And he devoutly believes that America can make itself better—not through the semantic charade of a slicked-up Social Darwinism but through a compassionate pragmatism that once made us the envy of the Old World. ■

IV. CURRICULA SOLUTIONS

Academic Preparation For College

What Students Need to Know and Be Able to Do

The College Board is a nonprofit membership organization that provides tests and other educational services for students, schools, and colleges. The membership is composed of more than 2,500 colleges, schools, school systems, and education associations. Representatives of the members serve on the Board of Trustees and advisory councils and committees that consider the College Board's programs and participate in the determination of its policies and activities.

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The College Board, New York, 1983

II. The Basic Academic Competencies

The Basic Academic Competencies are the broad intellectual skills essential to effective work in all fields of college study. They provide a link across the disciplines of knowledge although they are not specific to any particular discipline.

The Basic Academic Competencies are reading, writing, speaking and listening, mathematics, reasoning, and studying. These competencies are interrelated to and interdependent with the Basic Academic Subjects. Without such competencies, knowledge of history, science, language, and all other subjects is unattainable.

The Basic Academic Competencies are developed abilities, the outcomes of learning and intellectual discourse. There are different levels of competency; they can be defined in measurable terms.

Although the Basic Academic Competencies are not always identified explicitly, spelling them out provides a way to tell students what is expected of them. Knowledge of what is expected is crucial to effective learning.

In order to do effective work in college, it is essential that all students have the following academic competencies.

Reading

- The ability to identify and comprehend the main and subordinate ideas in a written work and to summarize the ideas in one's own words.
- The ability to recognize different purposes and methods of writing, to identify a writer's point of view and tone, and to interpret a writer's meaning inferentially as well as literally.
- The ability to separate one's personal opinions and assumptions from a writer's.
- The ability to vary one's reading speed and method (survey, skim, review, question, and master) according to the type of material and one's purpose for reading.

- The ability to use the features of books and other reference materials, such as table of contents, preface, introduction, titles and subtitles, index, glossary, appendix, bibliography.
- The ability to define unfamiliar words by decoding, using contextual clues, or by using a dictionary.

Writing

- The ability to conceive ideas about a topic for the purpose of writing.
- The ability to organize, select, and relate ideas and to outline and develop them in coherent paragraphs.
- The ability to write Standard English sentences with correct:
  - sentence structure;
  - verb forms;
  - punctuation, capitalization, possessives, plural forms, and other matters of mechanics;
  - word choice and spelling.
- The ability to vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.
- The ability to improve one's own writing by restructuring, correcting errors, and rewriting.
- The ability to gather information from primary and secondary sources; to write a report using this research; to quote, paraphrase, and summarize accurately; and to cite sources properly.

Speaking and Listening

- The ability to engage critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.
- The ability to answer and ask questions coherently and concisely, and to follow spoken instructions.
- The ability to identify and comprehend the main and subordinate ideas in lectures and discussions, and to report accurately what others have said.
- The ability to conceive and develop ideas about a topic for the

purpose of speaking to a group; to choose and organize related ideas; to present them clearly in Standard English; and to evaluate similar presentations by others.

- The ability to vary one's use of spoken language to suit different situations.

Mathematics

- The ability to perform, with reasonable accuracy, the computations of addition, subtraction, multiplication, and division using natural numbers, fractions, decimals, and integers.
- The ability to make and use measurements in both traditional and metric units.
- The ability to use effectively the mathematics of:
  - integers, fractions, and decimals;
  - ratios, proportions, and percentages;
  - roots and powers;
  - algebra;
  - geometry.
- The ability to make estimates and approximations, and to judge the reasonableness of a result.
- The ability to formulate and solve a problem in mathematical terms.
- The ability to select and use appropriate approaches and tools in solving problems (mental computation, trial and error, paper-and-pencil techniques, calculator, and computer).
- The ability to use elementary concepts of probability and statistics.

Reasoning

- The ability to identify and formulate problems, as well as the ability to propose and evaluate ways to solve them.
- The ability to recognize and use inductive and deductive reasoning, and to recognize fallacies in reasoning.
- The ability to draw reasonable conclusions from information

found in various sources, whether written, spoken, or displayed in tables and graphs, and to defend one's conclusions rationally.
- The ability to comprehend, develop, and use concepts and generalizations.
- The ability to distinguish between fact and opinion.

Studying

This set of abilities is different in kind from those that precede it. They are set forth here because they constitute the key abilities in learning how to learn. Successful study skills are necessary for acquiring the other five competencies as well as for achieving the desired outcomes in the Basic Academic Subjects. Students are unlikely to be efficient in any part of their work without these study skills.

- The ability to set study goals and priorities consistent with stated course objectives and one's own progress, to establish surroundings and habits conducive to learning independently or with others, and to follow a schedule that accounts for both short- and long-term projects.
- The ability to locate and use resources external to the classroom (for example, libraries, computers, interviews, and direct observation), and to incorporate knowledge from such sources into the learning process.
- The ability to develop and use general and specialized vocabularies, and to use them for reading, writing, speaking, listening, computing, and studying.
- The ability to understand and to follow customary instructions for academic work in order to recall, comprehend, analyze, summarize, and report the main ideas from reading, lectures, and other academic experiences; and to synthesize knowledge and apply it to new situations.
- The ability to prepare for various types of examinations and to devise strategies for pacing, attempting or omitting questions, thinking, writing, and editing according to the type of examination; to satisfy other assessments of learning in meeting course objectives such as laboratory performance, class participation, simulation, and students' evaluations.
- The ability to accept constructive criticism and learn from it.

III. Computer Competency: An Emerging Need

A revolution in communications and information technology is making the computer a basic tool for acquiring knowledge, organizing systems, and solving problems. As such, it is having a profound influence on learning and on the world of work.

In the immediate future most workers either will work directly with computers or have their work influenced by computers in some significant way. An influence as pervasive as this requires, among other things, an informed citizenry that not only understands what computers can and cannot do but also is aware of the problems and issues involved in their use.

In schools and colleges the computer is being used increasingly by students and their teachers as an instrument to receive, organize, store, analyze, and interpret information, as well as a medium for the communication of that information. Competency in its use is emerging as a basic skill complementary to other competencies, such as reading, writing, mathematics, and reasoning. The computer also provides access to bodies of knowledge in each of the academic disciplines.

Knowledge of the computer is basic to an understanding of the full range of procedures that may be applied to organizing information and solving problems in fields as diverse as mathematics, science, the social sciences, business, industry, language, and the arts. Applications of the computer to the study of writing, literature, art, music, and dance have highlighted its potential as a creative tool in these and other fields.

For these reasons students entering college will profit from the following preparation.

- A basic knowledge of how computers work and of common computer terminology.
- Some ability to use the computer and appropriate software for:
  - self-instruction;

  - collection and retrieval of information;
  - word processing (including the development of keyboard, composition, and editing skills);
  - modeling, simulations, and decision making;
  - problem solving—both through the use of existing programs and through experience with developing one's own programs.
- An awareness of when and how computers may be used in the academic disciplines and various fields of work, as well as in daily life.
- Some understanding of the problems and issues confronting individuals—and society generally—in the use of computers, including the social and economic effects of computers and the ethics involved in their use.

What High School Graduates Need

THE PANEL HAS ATTEMPTED TO PROJECT the future of the American job market to determine the sort of worker who will prosper in the future. It has asked its employer members to describe the employees they will need, and be able to employ, in the years ahead. A single answer comes from both sources: a person who is able and willing to learn throughout a working lifetime.

A person who knows how to learn is one well grounded in fundamental knowledge and who has mastered concepts and skills that create an intellectual framework to which new knowledge can be added.

It is precisely in the basic intellectual skills, however, that young employees show the greatest deficiencies. Many lack the ability to draw correct inferences from written, pictorial, or mathematical information; to understand oral instructions; to develop alternatives and reach conclusions; to express their ideas intelligibly and effectively; and to apply such basic concepts of economics as profit and cost.[1] All of these skills are important, even in entry-level jobs. Advancement to more responsible posts requires skills of an even higher order, including the ability to compose tables and reports, to consult reference and source materials, to apply mathematical concepts and procedures, to control complex equipment, and to address groups.

These conclusions derive from the panel's collective experience and from examinations by its members of their own industries. For example, representatives of leading banks and brokerage houses in New York City said they will need high school graduates with skills in reading, writing, mathematics, and oral expression at least as good as those of today's workers to fill entry-level jobs such as messenger, general office clerk,

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The National Academy of Sciences was established in 1863 by an Act of Congress as a private, nonprofit, self-governing membership corporation for the furtherance of science and technology for the general welfare. The terms of its charter require the National Academy of Sciences to advise the federal government upon request within the Academy's fields of competence. Under this corporate charter, the National Academy of Engineering and the Institute of Medicine were established in 1964 and 1970, respectively.

The Committee on Science, Engineering, and Public Policy is a joint committee of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. It includes members of the councils of all three bodies.

Reproduced with the permission of the National Academy of Sciences, ©1984 from "What High School Graduates Need" in High schools and the changing workplace: the employers' view; report of the Panel on Secondary School Education for the Changing Workplace. p. 17-27.

and teller. Applicants for higher entry-level jobs such as secretary, adjuster, or clerical supervisor will need even better skills.[2] The federal government has developed precise hiring standards for the hundreds of thousands of civilian high school graduates it employs in scores of white- and blue-collar occupations.[3] Some federal jobs require no more than a high school diploma, but many demand specific technical skills or knowledge acquired through apprenticeship, technical training, or work experience. Even these special skills, however, are built on a core of competencies that can be acquired in high school. For example:

- Every federal employee, whether a laundry worker, personnel clerk, or technician, must be able to follow written and verbal instructions, keep accurate records, and convey information orally.
- Workers as diverse as accounting clerks, upholsterers, and aircraft mechanics must be able to compute accurately to estimate costs, determine materials needed, and develop work plans.
- Occupations as varied as dental hygienist or equipment repair technician require familiarity with basic concepts of biology, chemistry, or physics.
- Very disparate workers, such as nursing assistants, clock repairers, and surveying technicians, need to be familiar with equipment used in laboratory work.

Beyond these specific skills, the panel agrees that young people need additional characteristics to succeed on the job: attitudes and understanding that lead to good work habits and successful interpersonal relationships. A clear understanding of the rights and responsibilities of workers and employers, and of the place of each in American economic and social life, will help students to function effectively as workers and to exercise their rights as employees and citizens.

Schools cannot meet the specific demands of every employer, of course. They cannot, for example, train students to fill out a particular organization's invoices or requisition slips or to follow its costing procedures. Yet, schools can, and must, teach students the basic skills that underlie these specific job requirements. A young person who can read skillfully and compute accurately will master quickly the versions of these skills required by a given employer. A young person who lacks the basic skills, however, probably cannot learn to fulfill an employer's expectations. (See Appendix B for a brief description of studies on the relation of cognitive skills to job performance.)

The panel has concluded, therefore, that the need for adaptability and lifelong learning dictates a set of core competencies that are critical to successful careers of high school graduates. These competencies include the ability to read, write, reason, and compute; an understanding of American social and economic life; a knowledge of the basic principles of the physical and biological sciences; experience with cooperation and conflict resolution in groups; and possession of attitudes and personal habits that make for a dependable, responsible, adaptable, and informed worker and citizen. Together, these competencies comprise what are needed to prepare a young person for an uncertain future.

That these competencies form the basis of all high-quality education is not, in the panel's opinion, accidental. The panel believes that the education needed for the workplace does not differ in its essentials from that needed for college or advanced technical training. The central recommendation of this study is that all young Americans, regardless of their career goals, achieve mastery of this core of competencies up to their abilities. For those intending to enter the work force directly after completing high school, additional training in specific vocational skills will increase employability and is naturally desirable. But no other skills, however useful or worthwhile, can substitute for the core competencies.[4]

Young people not planning on going to college may not require advanced or highly theoretical courses in mathematics, science, or other academic subjects, but they must have a working knowledge of these disciplines to permit them to perform job tasks accurately, correctly, and with understanding.

The workplace ordinarily affords a narrow margin for error. Workers who misinterpret instructions might damage costly machinery or tools and endanger themselves and others. Workers unable to compute with precision might fill orders improperly, losing their employers the good will of customers, or miscalculate cost information, confusing their employers' accounting systems and adding unnecessary costs.

Mastery of the core competencies to the best of one's abilities is both a necessary and reasonable goal. What differentiates students who end their education upon completion of high school from those going to college is not necessarily the ability or desire to learn; frequently, the differences take the form of economic resources, social backgrounds, cultural exposure, life styles, aspirations, or values. These differences do not dictate any lowering of educational standards, but they may suggest some variation in educational settings or techniques. Some students learn best in a scholastic environment; others in settings closer to "real life." Students not planning on postsecondary education, however, actually have *less* time to master the foundations of learning than those going on to college.

The panel has not attempted to recommend specific routes to mastering the core competencies; this lies properly in the realm of educators. The panel does urge in the strongest possible terms, however, that all educational programs be evaluated on the basis of their ability to provide the skills that all young people will need.

The Core Competencies

The core competencies judged by the panel to be required by employers and, by extension, for success in employment, are given below. The list is not exhaustive, but rather illustrative. Some of these skills, or similar concepts, have been advocated by others (see reference 1, for example); this report attempts to put them in one context. These competencies are transferable, vital to almost every job except the least skilled, and essential to upward mobility and adaptability.

Command of the English Language The panel predicates this list of competencies on possession of the most basic skill of all—a command of the English language, which it believes to be essential for success and mobility in American society. Although a second language may be useful in job mobility, all American young people, regardless of their home or native tongue, need a functional command of standard English in its written and spoken forms.

Reasoning and Problemsolving The capacity to reason and solve problems is the central indication of an educated person. Throughout their working lives, individuals will encounter problems or situations with various possible solutions. The ability to understand the consequences of alternative courses of action is an essential condition for success in employment. Well-developed reasoning capacity requires a person to be able to:

- Identify problems
- Consider and evaluate possible alternative solutions, weighing their risks and benefits
- Formulate and reach decisions logically

- Separate fact from opinion
- Adjust to unanticipated situations by applying established rules and facts
- Work out new ways of handling recurring problems
- Determine what is needed to accomplish work assignments.

Reading Each student needs to be able to read, comprehend, and interpret written materials. Job success often hinges on following written instructions, manuals, or labels. Workers must frequently use catalogs and reference books, read and draw inferences from correspondence and reports, and interpret correctly forms such as vouchers, requisitions, and work orders. Neither reading nor writing is taught separately in most high schools. However, every course in every academic subject can require students to read and write critically and extensively. Competent reading requires the ability to:

- Understand the purpose of written material
- Note details and facts
- Identify and summarize principal and subsidiary ideas
- Be aware of inconsistency in written material
- Verify information and evaluate the worth and objectivity of sources
- Interpret quantitative information; for example, in tables, charts, and graphs.

Writing It has been said that a person can write no better than he or she can think. All students need to be able to organize information and state it clearly and concisely in a written form that is grammatically correct. Employees in many lines of work are called upon to fill out forms, document experiences and procedures, record events, and present their ideas in memorandums, letters, and notes. Skillful writing requires the ability to:

- Gather information suitable for the purpose
- Organize information in a logical and coherent manner
- Use standard English syntax
- Apply the rules of correct spelling, punctuation, and capitalization
- Attribute references correctly
- Use reference books such as a dictionary, a thesaurus, and an encyclopedia
- Write legibly.

Computation All students need to be able to understand and apply basic mathematics, at least through elementary algebra. An understanding of geometry and trigonometry is desirable. Countless work tasks require computations of cost, time, volume, area, percentage, fractional share, and other mathematical relationships. Precise computation requires that a person be able to:

- Add, subtract, multiply, and divide whole numbers, decimals, and fractions accurately
- Calculate distance, weight, area, volume, and time
- Convert from one measurement system to another, for example, from English to metric
- Determine the costs, time, or resources necessary for a task
- Calculate simple interest
- Compute costs and make change
- Understand simple probability and statistics
- Calculate using information obtained from charts, graphs, and tables
- Use ratios, proportions, percentages, and algebraic equations with a single unknown
- Estimate results and judge their accuracy.

Science and Technology Whether employed in a factory, farm, office, shop, or retail store, American workers need to feel comfortable with technology.

Many jobs, of course, demand specific understanding of the physical and biological sciences, including the practical experience developed in laboratory work. Technical occupations of all kinds—in the fast-growing medical and health service fields, in communications, and in the military services—call on workers to deal effectively with mechanical and electronic equipment.

As the use of advanced technologies becomes ever more pervasive in our economy, schools must encourage students of both sexes to acquire a firm grounding in science and technology. Lack of an adequate scientific background and technological experience has precluded many, especially women, from competing for large numbers of desirable jobs in the past.

High school graduates, therefore, need the confidence that they can understand how things work. Nothing builds this confidence so effectively as the study of specific technologies and the scientific principles underlying them. While devices may consist of thousands of parts, individual parts are often simple, as are the rules for their interaction. Facility with technology comes from understanding these rules and in working with devices embodying them. That, the panel believes, is best achieved by combining classroom study with practical experience in school laboratories or outside school; for example, learning the principles of chemical combinations and performing simple chemical reactions; learning the basic electrical laws and operating a voltmeter; and studying the thermal properties of solids and examining the structure of an integrated circuit chip.

Competency in science and technology includes the ability to apply the scientific method, whether or not it is labeled as such; that is, the ability to formulate and state hypotheses, and then to evaluate them by experimentation or observation. That competency will serve all graduates, whether they work in technical occupations or not. It serves, for instance, in localizing a problem in a word-processing system, in repairing mechanical systems, or in identifying the source of a recurring error in computation.

Further, the well-educated high school graduate will be able to apply the basic principles of the physical, chemical, and biological sciences to work. Thus, high school graduates competent in the basic sciences will be able to evaluate risks better, understand the rationale for industrial processes, and even suggest how they might be improved. The particulars are less important than the generality: that knowledge of science and technology dissipates unknowns and enhances confidence in one's ability to analyze and solve a problem.

Finally, education in science and technology should include acquaintance with computers. That does not necessarily mean learning programming languages and the like, but it does mean acquiring knowledge of the basic functions of computers; knowing what they can and cannot do; some familiarity with the basic components of a computing system; and an understanding of the possibilities and limits of frequently used software packages such as word processors, data-base management systems, and electronic spreadsheets.

Oral Communication Success in any job requires, among other things, the aptitude to communicate thought, knowledge, and information through speech, whether with supervisors, coworkers, customers, or the general public. Competent oral communication includes the ability to:

- Communicate in standard English
- Understand the intent and details of oral communications
- Understand and give instructions
- Identify and summarize correctly principal and subsidiary ideas in discussions
- Obtain, clarify, and verify information through questioning
- Participate effectively in discussions.

Interpersonal Relationships Success in a career depends on the capacity to deal constructively and effectively with others. In turn, this depends on a knowledge of behavior appropriate to and customary in the workplace. Young people must understand that the standards of behavior, speech, and dress expected of employees often differ markedly from those acceptable in student circles. They also must realize that conflicting interests and opinions are inherent in many social interactions, but that such conflicts can and should be resolved through constructive means. Finally, they must recognize that employers cannot tolerate behavior, even if innocently intended, that offends customers, colleagues, other employees, or members of the general public. Effective interpersonal relations require the ability to:

- Interact in a socially appropriate manner
- Demonstrate respect for the opinions, customs, and individual differences of others
- Appreciate the importance and value of humor
- Offer and accept criticism constructively
- Handle conflict maturely
- Participate in reaching group decisions.

Social and Economic Studies Understanding how employees and employers fit into the economic structure of the community and country is essential to an appreciation of one's own contributions and responsibilities. Young people should realize that private employers purchase services in order to provide a product or service at a profit so that they can stay in business, while public employers must adhere to rules of public accountability. Only employees who contribute to these goals are likely to keep their jobs or advance in them. Students can gain this understanding best through a knowledge of how the American society and economy function, how various groups and interests interact, and what they can expect of one another. Adequate social and economic knowledge requires an understanding of:

- The history of present-day American society
- The political, economic, and social systems of the United States and other countries
- The fundamentals of economics, including a basic understanding of the roles of money, capital investment, product pricing, cost, profit, and productivity, and market forces such as supply and demand
- The concept of "trade-offs" and the differences between economic principles, facts, and value judgments
- The roles of industry and labor in creating wealth, maintaining employment, and raising the standard of living
- The forms and functions of local, state, and federal governments
- The rights and responsibilities of citizens
- Civil rights and justice in a free society.

Personal Work Habits and Attitudes Personal work habits indicate the level of responsibility one is capable of assuming. Positive habits and attitudes contribute significantly to success in performing tasks, dealing with others, and gaining employment. They are also vital to success in school and should be cultivated long before a student enters the work force.[5] Constructive work habits and attitudes require:

- A realistic positive attitude toward one's self
- A positive attitude toward work and pride in accomplishment
- A willingness to learn
- Self-discipline, including regular and punctual attendance and dependability
- The ability to set goals and allocate time to achieve them
- The capacity to accept responsibility
- The ability to work with or without supervision
- Appropriate dress and grooming
- An understanding of the need for organization, supervision, rules, policies, and procedures
- Freedom from substance abuse
- Appropriate personal hygiene.

The panel emphasizes again that these competencies are goals, by no means universally achievable to the same level by all, but nevertheless important for all to strive toward. The panel also emphasizes that they are incomplete goals, limited to those believed necessary for preparing high school graduates for satisfying careers. These goals must be supplemented by others if high school graduates are to participate fully in the cultural and civic life of this country.

References

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[1] See, for example, Colorado Department of Education, *op. cit.*, p. 2.; Center for Public Resources, *op. cit.*; Leonard Lund and E. Patrick McGuire, *op. cit.*

[2] Report submitted to the panel by panel member Frederick A. Roesch (available from the Committee on Science, Engineering, and Public Policy).

[3] Report submitted to the panel by panel member Loretta Cornelius (available from the Committee on Science, Engineering, and Public Policy).

[4] For a state perspective, see Wellford W. Wilms, "The Limited Utility of Vocational Education: California Employers' Views," *Public Affairs Report*, Vol. 24, No. 14, August 1983.

[5] Employee attitudes and their relation to job performance will be treated in a forthcoming report by the Committee for Economic Development, *Business and the Schools: Identification of Employer Needs*, to be published in the fall of 1984.

Indicators of Precollege Education in Science and Mathematics

A Preliminary Review

Senta A. Raizen and
Lyle V. Jones, editors

Committee on Indicators of Precollege
Science and Mathematics Education

Commission on Behavioral and
Social Sciences and Education

National Research Council

The National Research Council was established by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and of advising the federal government. The Council operates in accordance with general policies determined by the Academy under the authority of its congressional charter of 1863, which establishes the Academy as a private nonprofit, self-governing membership corporation. The Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in the conduct of their services to the government, the public, and the scientific and engineering communities. It is administered jointly by both Academies and the Institute of Medicine. The National Academy of Engineering and the Institute of Medicine were established in 1964 and 1970, respectively, under the charter of the National Academy of Sciences.

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1

Introduction and Summary

INTRODUCTION

Background

In the last 2 years, concern over the state of science and mathematics education in the schools of the United States has become a prominent topic on the public agenda. Special commissions and task forces have emphasized the importance to the nation of adequate student preparation in science and mathematics. For example, the National Science Board Commission on Precollege Education in Mathematics, Science and Technology (National Science Foundation, 1983:1) states that "improved preparation of all students in the fields of mathematics, science and technology is essential to the maintenance and development of our Nation's economic strength, to its military security, to its commitment to the democratic ideal of an informed and participating citizenry and to fulfilling personal lives for its people." The Task Force on Education for Economic Growth (1983) in the report Action for Excellence views the declining exposure of students to technical subjects as a serious problem that threatens to become more so as American workers face increasing technological demands. The Report of the Twentieth Century Fund Task Force on Federal Elementary and Secondary Education Policy (1983) presents the view that training in mathematics and science is critical to both the nation's economy and polity--to the economy by ensuring that there are ample personnel who are capable of filling the increasing number of jobs demanding these skills, and to the polity by providing citizens with the education in science that is essential if they are to participate intelligently in political decisions about such controversial issues as radiation, pollution, and nuclear energy. The National Commission on Excellence in Education (1983) recommends that schooling now include "five new basics": in addition to 4 years of English and 3 years of social studies, all high school students should study no less than 3 years of mathematics, 3 years of science, and 1/2 year of computer science.

These national bodies, convened with private or governmental sponsorship, agree that there are serious problems in precollege mathematics and science education and that those problems may constitute a threat to the economic future and to the security of our nation. Other groups, sponsored by a number of states, have reached similar conclusions. The reports suggest that many U.S. students are leaving high school without adequate preparation in science and mathematics, whether for the job market or for continuing their education. The reports also identify specific school deficiencies: teacher shortages, inadequate curricula, low standards of student performance.

According to some critics (see, for example, Peterson, 1983; Stedman and Smith, 1983), however, not all of the conclusions of the national commissions are adequately documented. Yet the expressed concerns about deficiencies already have led to initiatives by government and by the private sector at the national, state, and local levels. Legislation passed by Congress in 1983 made available funds to the National Science Foundation to be invested specifically in training mathematics and science teachers and in providing improved instruction in these fields, and there were further congressional appropriations in 1984. More than 40 states either have increased high school graduation requirements in mathematics and science or are considering an increase in requirements (Education Commission of the States, 1983). University systems in several states have announced higher admission requirements. State and local initiatives provide in-service education in mathematics or science for teachers already practicing and encourage college students to embark on careers in mathematics or science teaching. Private corporations are donating equipment, providing training and research experiences for teachers and students, and lending staff members to the schools for special programs.

The renewed interest and investment in precollege mathematics and science education make it especially important to understand the current condition of these fields and to be able to track future changes. Two major reports on education released recently have urged that educational progress be systematically monitored. The National Science Board Commission (National Science Foundation, 1983:12) recommends:

> The Federal government should finance and maintain a national mechanism to measure student achievement and participation in a manner that allows national, state and local evaluation and comparison of educational progress . . . [an] assessment mechanism is needed to enable local communities, States and the Nation to monitor their progress toward improving mathematics, science and technology skills among elementary and secondary students and to incorporate such information into their program development activities. . . . The Commission firmly believes that achieving its educational objectives requires regular monitoring of educational progress, and that such monitoring will itself increase the speed of change.

The report of the Carnegie Foundation for the Advancement of Teaching (Boyer, 1983) recommends that new student achievement tests be developed. They would be linked to the content of the high school curriculum and would be given to all students toward the end of high school to evaluate what students have learned.

Even before the issuance of these reports, the National Academy of Sciences and the National Academy of Engineering (1982) had expressed concern about the status of precollege science and mathematics education and also about the facilities available for monitoring the nation's educational progress. A national convocation on precollege science and mathematics education held by the Academies drew attention not only to the problems but also to the lack of adequate information regarding teachers, enrollments, and other important issues.

To lay the foundation for the development of a monitoring system for use at the national, state, and local levels, the Committee on Indicators of Precollege Science and Mathematics Education was created in 1983. The committee is charged with proposing a framework for an efficient set of education indicators, filling in the framework to the extent possible with existing data, and suggesting data and data analyses that will be needed in the future for a continuing portrayal of the condition of precollege science and mathematics education. This report covers the first phase of the committee's work.

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Scope of Report

In the work discussed in this report, the committee selected a preliminary set of indicators, based on the kind of information that is generally requested by people making decisions about education and on which some data have been collected. The committee also reviewed the information currently available on selected indicators and has provided some findings on temporal trends and comparisons with other countries. Lastly, the committee has judged the extent to which the available information can serve to construct indicators and has made recommendations for improvement.

This report is a preliminary statement rather than a definitive document on indicators. It represents a first attempt to select indicators of precollege mathematics and science education that might be constructed over the short range and presents the committee's recommendations for improving the information pertinent to the selected indicators. The report is addressed primarily to the agencies that are most likely to develop and publish education indicators for science and mathematics, the National Science Foundation, the National Center for Education Statistics, the National Institute of Education, the International Association for the Evaluation of Educational Achievement, as well as to state and local offices of education. It is also addressed to a wider audience of educators, educational researchers, scientists and mathematicians, with the intent of stimulating critical comment that may help to advise those agencies.

This report has several limitations. The committee was asked to prepare a preliminary report promptly. Both the shortness of time and budgetary restrictions placed constraints on its work. As a consequence, the committee chose to restrict its scope to indicators that can be constructed from information already being collected at the national, state, or local levels or that could be collected by a modest extension of present data collection activities.

In this report the committee summarizes conclusions and makes recommendations regarding the quality of available information and its suitability for the selected indicators. The committee also derives from the data some findings about the current condition of science and mathematics education. In its interpretation of cited studies, the committee routinely has focused only on statistically significant results as indicated by the standard errors reported in the original sources.

The committee does not provide value judgments about the findings derived from the studies and data cited. It is the committee's view that such judgments should be made by educators, scientists, legislators, school boards, parents--all those concerned with the quality of education in this country--based on a clear understanding of current conditions and trends. The report tries to further this understanding; it is not intended to be a certificate of health or a report card on the nation's mathematics and science education.

The committee makes no attempt in this report to investigate underlying causes of the observed conditions. Effective education policy requires, first, an understanding of current conditions, second, a definition of preferred conditions, and, third, an appreciation of means for changing current to preferred conditions, which in turn requires an understanding of their causes. This preliminary report deals only with a portrayal of current conditions; it does not define preferred conditions, nor does it discuss how changes leading to the preferred conditions might be brought about.

When projections about conditions over the next several years are given, as in the section on teachers, they are based on extrapolations of current modes of school operation and on predictable changes such as demographic trends. Possible structural reforms of the present system, for example, that might accompany the application of information technology to education, or major alterations in the school curriculum with respect to the content and sequencing of mathematics, science, and perhaps newly added technology instruction, would alter the projections.

Logical next steps in the development of an adequate monitoring system would entail considering more imaginative and less conventional indicators that might serve to guide policy for mathematics and science education, considering indicators that might be useful in the context of possible changes of structure or function in the education delivery system, and, of course, designing better data gathering methods and analyses for all indicators. In the next phase of the work, these objectives will be addressed.

6

SUMMARY

The first section of this summary presents a short discussion, given in greater detail in Chapter 2, of the reasons for choosing particular schooling variables as the basis for constructing indicators. Subsequent sections of the summary provide the committee's findings, conclusions, and recommendations on the selected indicators related to teachers, curriculum content, instructional time and course enrollment, and student achievement in science and mathematics.

Selecting Indicators

A large amount of statistical data and research information on education in general is available. At the national level, the National Center for Education Statistics (NCES), a component of the Department of Education, publishes two major compilations annually. The NCES and other components of the Department also sponsor periodic surveys--for example, the National Longitudinal Study of 1972 (NLS 1972) high school graduates and High School and Beyond Study (HSB), a survey of 1980 sophomores and seniors and 1982 seniors--that provide information on student enrollment and achievement, although information specific to mathematics and science education is limited. The Department, through the National Institute of Education, also supports the National Assessment of Educational Progress (NAEP), which has gathered information nationwide on scholastic achievement (including mathematics and science achievement) and student attitudes since 1969. The National Science Foundation (NSF) has special responsibility in the area of science and mathematics education: it has sponsored studies on science and mathematics in the schools and published information from them and other sources. Both NCES and NSF have provided support for U.S. participation in the studies conducted by the International Association for Evaluation of Educational Achievement (IEA).

Every state also has its own data collection system, much of it devoted to fiscal, demographic, and managerial information, but also including data on enrollments, personnel, and student assessment, although there is considerable variation in the types of data collected by states and in the manner of collection. (Examples of the types of data collected by states are given in the

Appendix.) The larger local education districts similarly collect information they find necessary for their internal operation as well as data requested by the state agencies. Information systems of local education districts exhibit an even greater diversity than those of the state systems.

Thus, considerable data are available on precollege science and mathematics education, but they are derived from diverse sources, address similar questions differently, and leave some pertinent issues unaddressed. To begin the development of an orderly monitoring system, the committee's first task was to select a limited set of variables and measures deemed essential to portraying the state of science and mathematics education. The committee chose to concentrate on variables generally identified as critical to the condition of education and on which there were some data and information available. The outcomes of science and mathematics education were considered first, followed by the schooling processes and inputs that can be associated with the selected outcomes.

Outcome Variables

The primary goal of instruction in science and mathematics is student learning. The most explicit student outcome, and one that can be tied directly to schooling variables, is the knowledge and skills gained by students, that is, student achievement in science and mathematics. Hence, the first, most obvious outcome variable the committee selected is student achievement.

A second outcome often desired from instruction in these fields is the development of more favorable student attitudes toward science and mathematics. At this time the committee is not giving emphasis to indicators on attitudinal variables because their relationship to the primary goal of student achievement (or to later-life outcomes) is not clear. Other outcomes considered by the committee included choice of college majors, choice of careers, and later career paths. Each of these is important to individual and societal goals and is relevant to the distribution of human resources. However, the more distant an outcome from the immediate purpose of instruction, the more tenuous the link and the more likely that nonschool variables affect the outcome. Pending research findings that more clearly link school experiences to life outcomes, the committee did not chose indicators representing such outcomes.

As to measures of achievement, the only ones available at the national level that are applicable to the whole student population are test results from NAEP, NLS, and HSB. The committee does not believe that the scores obtained on the Scholastic Aptitude Tests (SATs) developed by Educational Testing Service (ETS) are appropriate measures of school outcomes for all students in science and mathematics, because the population taking these tests is self-selected and not representative of the whole student population. However, for college-bound students who take them, trends in scores on the achievement tests in specific subjects also developed by ETS for the College Board's Admission Testing Program and the tests of the American College Testing Program give an indication of changing levels of achievement over time in academic subjects offered in high school.

From time to time studies of school achievement in various countries are carried out. The most comprehensive of these have been the studies conducted under the auspices of the IEA. However, the most widely published results for mathematics date back to 1964 and for science to 1970. New IEA studies are currently under way in both fields, and some preliminary results from these studies are available.

Most states have assessment programs as well, although they vary from state to state; they generally involve selective achievement testing at several grade levels, sometimes using commercial tests, sometimes state-constructed instruments. State tests are used for a variety of purposes: for assessing absolute achievement, for determining competency, for comparison with national results, for comparison of schools and school districts, for checking on the adequacy of curricula and instruction. Some of these purposes require periodic adjustment of the tests, which makes comparisons over time hazardous.

Using test scores as measures of student achievement assumes at least moderate test validity for the assessment of student learning. Unfortunately, it has proved difficult with current testing methodology to construct tests for widespread use that adequately asses the range of complex skills and in-depth understanding needed for proficiency in mathematical or scientific concepts and processes. The committee, in its recommendations, discusses the importance of improving tests, especially for testing the knowledge and skills acquired by individuals. Nevertheless, the committee has concluded that existing tests of mathematics and science of the kinds used by

NAEP, HSB, and IEA are sufficiently valid for the purpose of indicating student achievement at the group level.

Process Variables

The selection of student achievement as the outcome variable of greatest interest determines to a considerable extent what schooling input and process variables need to be selected, namely, those that have some causal relationship to student achievement. One process variable in particular is assumed in educational practice to be closely linked to student achievement: enrollment in or instructional time spent on the requisite subject. And recent work on the achievement of high school students in mathematics and in science documents the positive effects of time spent on relevant instruction or courses, especially if instructional time is managed efficiently; in fact, it appears to be one of the most robust findings coming from major longitudinal studies and assessment efforts. Consequently, based on research evidence as well as on educational practice and experience, the committee decided that course enrollment and instructional time spent on subject matter should be considered key process variables in indicators of mathematics and science education. A related exposure component is time spent on homework, which appears to be associated with student achievement, and it is included as part of these process variables.

Selection of course enrollment and instructional time in no way is intended to minimize the importance of such other process variables as teacher behaviors, student behaviors, and classroom environment, but because of the present state of knowledge about the relationships between these variables and student achievement and about how to assess them, the committee decided it would be premature to use them at this time as indicators of mathematics and science education.

Input Variables

In addition to outcome and process variables, a third set of variables in measuring science and mathematics education are schooling inputs. The most obvious inputs are numbers (and quality) of teachers responsible for those areas of instruction and the content of the curriculum.

Looking first at the numbers of mathematics and science teachers, reasonably consistent statistics are available from NCES and the National Science Teachers Association. However, the significant indicator is not the supply of teachers, but the supply compared with the numbers needed; this comparison must be based not only on the size of the existing pool, but also on the teacher turnover rate, total high school enrollments, and the effects of increased high school graduation requirements that are being mandated by a number of states. But even good estimates of the numbers of teachers do not take into account quality, the competence of either those teachers now assigned to mathematics and science classes or of those entering the fields.

There is no nationally accepted standard for a "qualified" science or mathematics teacher. While certification can be used as a first approximation of quality, certification requirements vary considerably from state to state. Hence, estimates of the numbers of qualified people teaching mathematics or science are open to question. In spite of these difficulties in measuring the supply and quality of teachers, however, the committee decided that their importance warranted selecting them as variables.

The argument for selecting content of curriculum as a variable is analogous to that for selecting instructional time/course enrollment: the subject matter actually taught is important to student achievement. Recent syntheses of the sizable research literature on the efficacy of alternative science curricula and data from NAEP and HSB support this assumption. It should be noted that, of the variables the committee considered it important to assess, this one has received the least attention, probably because it is the most difficult to track.

Two other indicators of input were considered by the committee: public attitudes toward science and mathematics education and funding for education. Examining the results of 15 years of polling by the Gallup Organization on the public's attitudes toward education yields consistent results: mathematics ranks high in importance as a school subject and science generally ranks in the middle. Since these public attitudes appear to have changed little over the last 15 years, and since the relationship between public attitudes and schooling outcomes is tenuous, at best, the committee decided not to recommend the development of further indicators for this variable.

With regard to funding, it is widely assumed that the quality of schooling is a direct function of the amount per pupil of financial support provided to a school; however, research studies do not consistently yield that conclusion. Major cost factors are teacher salaries, class size, and expenditures for physical plant and facilities; none of these has been demonstrated to relate consistently to student learning. Of course, one might speculate that higher salaries would attract to the teaching profession many highly competent persons who in the past have chosen other, more lucrative, occupations.

Even if research results more clearly supported the hypothesis that increased financing yields better learning in the schools, serious problems would remain in using an index of financial support as an indicator of mathematics and science education. For example, data would need to be collected for salaries of teachers in mathematics and science, rather than for salaries of all teachers. In addition, some adjustment of reported financial data would have to be made to compensate for widely differing costs of services in different regions of the country and even in different communities within a region. For these reasons, the committee decided not to use any financial data as indicators of science and mathematics education at this time. Given interest in the funding of education as well as the mixed research findings, however, financial data should be retained for future consideration as an indicator.

In sum, the committee identified a minimal set of key variables that should be monitored, shown below, as a beginning set of indicators of the condition of precollege science and mathematics education. The rest of the chapter presents the committee's findings, conclusions, and recommendations about that condition using the four selected variables. They are presented in the logical order of inputs, process, and outcome.

Although the committee selected for the development of indicators four aspects of precollege mathematics and science education generally recognized to be essential, due to limitations in the data base, only partial and limited indicators of these aspects can be constructed at this time. The committee has developed recommendations designed to improve the quality of available data and thus to enhance the value of these indicators.

Even at their best, these indicators are not sufficient to provide an adequate portrayal of the state of science and mathematics education in the nation's schools. There

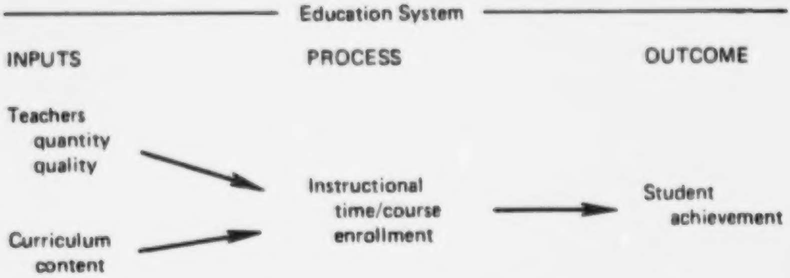

FIGURE 1 Areas of science and mathematics education to be monitored.

is a need to search for more imaginative and less conventional indicators to guide educational policy, including new indicators that have the potential to take account of likely changes in the function and structure of education. Moreover, many important issues about science and mathematics education cannot be understood by numerical indicators. Therefore, any portrayal of these fields must also include studies directed toward understanding the qualitative causes of the observed conditions.

Teachers

Findings: Supply and Demand

Aggregate Quantity

- Forecasts of aggregate supply and demand of secondary school teachers in the physical and biological sciences and in mathematics show shortages over the next several years in mathematics and the physical sciences. A low estimate, based on little change in current trends of overall supply and demand, indicates an annual shortage of 2,800 science teachers, mostly in the physical sciences, and 3,700 mathematics teachers. If teachers currently assigned to mathematics and science classes but not qualified to teach these subjects were to be replaced at a rate of 5 percent per year of all teachers in these fields, the annual shortage would be 9,200 in mathematics and 8,000 in science. Both these forecasts are driven by the education system as presently constituted and do not take into account the possibility of structural reform.

- Aggregate estimates of teacher supply and demand mask great differences among regions of the nation, states, and local school districts within states.

Uncertainties

- All estimates of teacher supply and demand are accompanied by large uncertainties.

With respect to supply, there are three major gaps in knowledge:

(1) The data on the actual numbers of teachers assigned to mathematics and science classes are inadequate, especially as aggregated at the national level.
(2) The number of inactive teachers who return each year to fill vacancies is unknown. Since the number of trained teachers who do not enter teaching or who leave teaching is sizable, this represents a considerable resource. The number of teachers drawn from the inactive pool may increase as desirable job opportunities arise.
(3) The most recent data on the annual supply of newly certified entrants to teaching--3,200 in mathematics and 3,600 in science--are 4 years old. Hence, the effects of current incentives to draw people into the field are unknown. The incentives include loan programs for college students preparing to be teachers, in-service training for out-of-field teachers, and employment of retired scientists and engineers as teachers.

With respect to demand, there are four unknowns:

(1) While enrollments are dropping, vacancies tend to be filled with teachers from other fields who have tenure in a district, rather than with new entrants certified in the field with vacancies. This practice, the extent of which is unknown, reduces the demand for additional teachers, even though it may be detrimental to the quality of science and mathematics teaching.
(2) The extent to which school systems will seek to replace out-of-field teachers or will choose instead to provide in-service training is unknown.

Such choices will in part be influenced by state and federal support policies for teacher education and in part by local board policies and teacher contracts.

(3) To the degree that increased high school graduation requirements will entail having to offer more courses in mathematics and science, teacher shortages will be aggravated, but how much is unknown.

(4) Demand forecasts are generally based on extrapolation of current conditions, taking account of likely changes in enrollment, class size, and curriculum. They do not take into account possible structural changes in the education system.

Findings: Quality

Lack of Information

- Adequate information is lacking on the qualifications of the teachers who are responsible for teaching mathematics and science in high school, middle/junior high school, or elementary school.
- Information on certification, the only proxy available for qualification, is lacking for all but new entrants, although data on a national sample of the teaching force are now being collected.

Requirements for Teaching Mathematics and Science

- Even if available, information on certification is of questionable use as a measure of qualification because state certification requirements and preservice college curricula reflect a wide range of views on what constitutes a qualified or competent teacher in mathematics or science. Moreover, teachers currently certified obtained their certification at different times that may have required different types of preparation; therefore, certification even within the same state does not connote equivalent preparation.
- Although guidelines on teacher preparation developed by professional societies are generally available, they have not been uniformly adopted.

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Conclusions and Recommendations

Supply and Demand

- A suitable indicator to assess the sufficiency of secondary school science and mathematics teachers would be either the ratio of or the difference between projected demand and anticipated supply of qualified teachers. The ratio would indicate how close to balance demand and supply are; the difference would indicate the number of teachers that need to be added or that exceed the demand. The construction of such an indicator on teacher demand and supply is at present not feasible at the national level because of the lack of a meaningful common measure of qualification.
- Individual states and localities might construct this type of indicator by using certification as an approximation for qualification or developing alternative criteria for teacher competence. In each case, an adequate determination would entail estimates of both demand and supply under alternative sets of assumptions about anticipated enrollments in mathematics and science classes and new entrants into the teaching of these fields. Aggregation of the state data might provide a useful national picture, especially if, in addition, information was reported concerning differences among states.

Quality

- The disparate views on teacher qualification and the variation in certification standards indicate the need to rethink the initial preparation and continuing training appropriate for teachers with instructional responsibilities in science and mathematics. Guidelines that have been prepared by professional societies need to be considered by the wider educational community, including bodies responsible for the certification of teachers and accreditation of teacher education programs. Requirements should be detailed separately for teachers in elementary school (grades 1 to 5 or 6), middle or junior high school (grades 6 or 7 to 8 or 9), and high school (grades 9 or 10 to 12), with particular attention to requirements that can be translated into effective college curricula and in-service education for teachers.

- The development of guidelines for the preparation and continuing education of teachers would be advanced if the attributes of successful teaching in science or mathematics were better understood. Further research is necessary on the relationships between teacher training and student outcomes; for example, the effects on student achievement of different types of preservice and in-service training and of teaching experience. Current initiatives to augment the pool of science and mathematics teachers should be monitored to assess their effectiveness.

Curriculum Content

Findings

Opportunity to Learn

- Exposure to specific content as conveyed by curriculum materials and explicit teaching is a critical factor in student achievement.
- Although commonly used textbooks and tests introduce a modicum of similarity in the range of topics generally treated within a year's course of instruction, emphasis varies from text to text, class to class, and test to test. Hence, for the nationally normed achievement tests often used at the elementary and middle school levels, there may be a discrepancy between a student's opportunity to learn and the subject matter covered on the test, while at the same time the student may have learned considerably more than the test indicates.

Textbooks and Courses

- To a large extent, the content of instruction is based on the textbook used in a class, yet there is no continuing mechanism to encourage periodic and systematic analysis of the use and content of science and mathematics texts. The Commission on Excellence in Education has called for more widespread consumer information services for purchasers of texts.
- At the secondary school level, and particularly in mathematics, course titles are a questionable indicator of content studied. The current practice of accepting similar course titles as representing exposure to similar

material is likely to produce data of questionable quality.

Conclusions and Recommendations

Curriculum Content

- There are no established standards for content derived either from past practice, practice elsewhere, anticipated need, or from theoretical constructs developed, say, from the nature of the discipline being taught or from learning theory. Until some consensus can be reached on instructional content that represents desirable alternatives for given learning goals, it is premature to suggest a specific indicator for this area.
- Although the identification of an indicator for the content of mathematics and science instruction is not feasible at present, this does not alter the importance of this schooling input. Finding out what content students are exposed to is a necessary first step.
- When information on what is currently taught has been collected and analyzed, reviews of the curriculum should be done by scientists, mathematicians, and other experts in the disciplines as well as teachers and educators. The reviews should evaluate material covered at each grade level or by courses, such as first-year algebra or introductory biology; consider relationships among grade levels or courses; and identify the knowledge and skills expected of students at the completion of each grade or course. Such reviews are needed in conjunction with addressing the critical matter of what content should be taught in mathematics and science.

Textbooks and Courses

- At a minimum, periodic surveys should be conducted to determine the relative frequency of use of various mathematics and science textbooks at each grade level in elementary school and for science and mathematics courses in secondary school. Timing of surveys should take into account the common cycles of textbook revision.
- Surveys of textbook use should be followed by content analyses of the more commonly used texts. Analyses should proceed along several different lines: balance between the learning of recorded knowledge

(concepts, facts) and its application (process), emphasis given to specific topics, adherence to the logic of a discipline, opportunity and guidance for student discovery of knowledge, and incorporation of learning theory.

- Intensive studies should collect information from teachers and students on topics actually studied within a given grade or course. Observation of samples of individual classrooms can help to document the content of instruction. Such studies could help to inform curriculum decisions by local districts, even though the results may not lend themselves to generalization over a state, let alone over the United States as a whole.
- Improved definitions of secondary school courses, based on their content, should be developed. As a first step, use of a standardized course title list, such as _A Classification of Secondary School Courses_ (Evaluation Technologies, Inc., 1982), should be considered.

Tests

- Critical analysis of standardized tests should continue so as to establish their degree of correspondence to the instructional content of the class subjects for which they are used. Consideration should be given to inviting the judgment of teachers (and older students) concerning the students' opportunity to learn the material that is covered on each test.

Instructional Time and Course Enrollment

Findings

Instructional Time and Student Learning

- The amount of time given to the study of a subject is consistently correlated with student performance as measured by achievement tests, at the elementary school as well as at the secondary school level.
- Time spent on homework is also correlated with student achievement. The attention paid to homework by the teacher affects its contribution to student performance.

Measuring Instructional Time: Elementary School

- For elementary schools, not enough data are available to discern clear trends over the last 20 years with respect to amount of instructional time spent on mathematics and science. On average, about 45 minutes a day are spent on mathematics and 20 minutes on science. Existing information, however, points to great variability from class to class in the amount of time given to instruction in general and to each academic area specifically.

Measuring Instructional Time: High School

- The average high school senior graduating in the early 1980s has taken about 2-3/4 years of mathematics and 2-1/4 years of science during grades 9-12.
- Compared with 20 years ago, average enrollments of high school students in science have declined. While this trend now appears to be reversing, enrollments have not returned to the level of the early 1960s.
- High school enrollments in mathematics have increased over the last decade by about a semester.
- College-bound students are taking more mathematics and physical science courses in secondary school than they did 10 years ago, and the increases were continuous throughout that period. The gap in enrollment between males and females in advanced mathematics courses is narrowing.
- A number of problems attend enrollment data currently available: uncertainties generated by using self-reports, differences in questions and method from survey to survey, and ambiguities created by similar course titles in mathematics that refer to different content or different levels of instruction.

Conclusions and Recommendations: Elementary School

Measures of Instructional Time

- The average amount of time per week spent on mathematics instruction and on science instruction should be measured periodically for samples of elementary schools. This measure would serve as an indicator of length of exposure to pertinent subject matter; values can be compared for different years. Care must be taken, however, to ensure common understandings in collecting measures of time as to what constitutes science or mathematics instruction. Time given to mathematics or science, expressed as a percent of all instructional time, would indicate the priority given to these fields.

- Efficiency of instruction should be assessed by comparing allocated time with instructional time and with time that is actually spent on learning tasks that appear to engage students, as established by observation.
- Time spent on science and mathematics instruction in elementary school should be tracked on a sample basis at the national, state, and local levels. Logs kept by teachers could be used for this purpose, with selective classroom observation employed to check their accuracy.

Improving Methods for Collecting Information

- Time allocated by the teacher to instruction is not equivalent to time actually spent by the student. Classroom observation is needed to differentiate between the two. Time spent on such different components of instruction as laboratory work, lecturing, and review of text or homework may also affect student outcomes. Case studies that document use of instructional time are expensive, but this variable has proven to be a sufficiently potent mediator of learning that the investment appears warranted.
- Experimentation and research should be carried out to develop a proxy measure for time spent on instruction that would permit collecting the pertinent information at reasonable costs.
- Further documentation is needed to establish the variability of time spent on instruction over classes and over calendar time. The results of such documentation should serve to establish the extent and periodicity of data collection needed for this indicator.

Conclusions and Recommendations: Secondary School

Measures of Course Enrollment

- For grades 7 to 12, enrollments in mathematics and science courses at each grade level and cumulatively for the 6 years of secondary school or for the 3 or 4 years of senior high school should be systematically collected and recorded. (See the pertinent recommendation in the above section on curriculum content.) Alternatively, the mean number of years of mathematics or science taken or percentages of students taking 1, 2, or 3 or more years of such courses can be used as a measure.

- The disparities in mathematics and science enrollment among various population groups warrant continued monitoring, so that distributional inequities can be addressed. National data on student enrollments collected in connection with the periodic surveys recommended above may be insufficient for this purpose. States should consider biennial or triannual collection of enrollment data by gender, by ethnicity, and by density of the school population.

Improving Measures of Course Enrollment

- Comparisons of enrollment over time are likely to be of great interest, but high-quality data are needed. Obtaining such data requires consistency in the design of surveys, data collection, and analysis. It also requires reduction of current ambiguities, for example, using a standardized system for describing courses, relying on transcripts or school enrollment logs rather than on student self-reports, and sampling a comparable universe from study to study.
- The periodic studies of high school students have provided useful information, but greater effort should be directed toward reducing methodological dissimilarities. Also, the time between studies sometimes has been too long. Surveys of the type represented by High School and Beyond and NAEP should be repeated no less than every 4 years.
- Time spent on homework in mathematics and science should be documented at all levels of education. Studies need to record how homework is used to support in-class instruction in order to prompt the use of better measures of total learning time in each grade.
-

Assessing the Effects of Policy Changes

- Many states are increasing requirements for high school graduation; some state university systems are increasing requirements for admission. The effects of these policy changes on student enrollment in high school mathematics and science courses and on the content of these courses should be monitored.

Student Outcomes

Findings

Tests

• It has proved difficult with current test methodology to construct tests that can be used for large numbers of students and yet are adequate for assessing an individual's cognitive processes, for example, the ability to generalize knowledge and apply it to a variety of unfamiliar problems. However, existing tests of mathematics and science of the kind employed by NAEP, HSB, and IEA are sufficiently valid for the purpose of indicating group achievement levels.

Achievement: All Students

• Evidence suggests an erosion over the last 20 years in average achievement test scores for the nation's students in both mathematics and science. Results of the most recent assessments indicate a halt to this decline and, at some grade levels, even a slight increase in scores in mathematics. Much of this generally observed but small increase is due to increasing achievement scores for black students, especially for mathematics in the lower and middle grades.

• Analysis of the most recent NAEP mathematics assessment yields evidence that gains have been made on computational skills but that there is either no improvement or a slight decrease in scores on test items that call for a deeper level of understanding or more complex problem-solving behavior.

• Available information on how well U.S. students perform compared with students in other countries shows U.S. students generally ranking average or lower, with students in most of the industrialized countries performing increasingly better than U.S. students as they move through school. Taking account of different student retention rates in different countries changes this finding somewhat in favor of the United States, but the most recently available data, especially data comparing the United States to Japan, are unfavorable for the United States.

Achievement: College-Bound Students

- There is evidence that college-bound students perform about as well on tests of mathematics and science achievement as they did a decade or two ago.

Conclusions and Recommendations

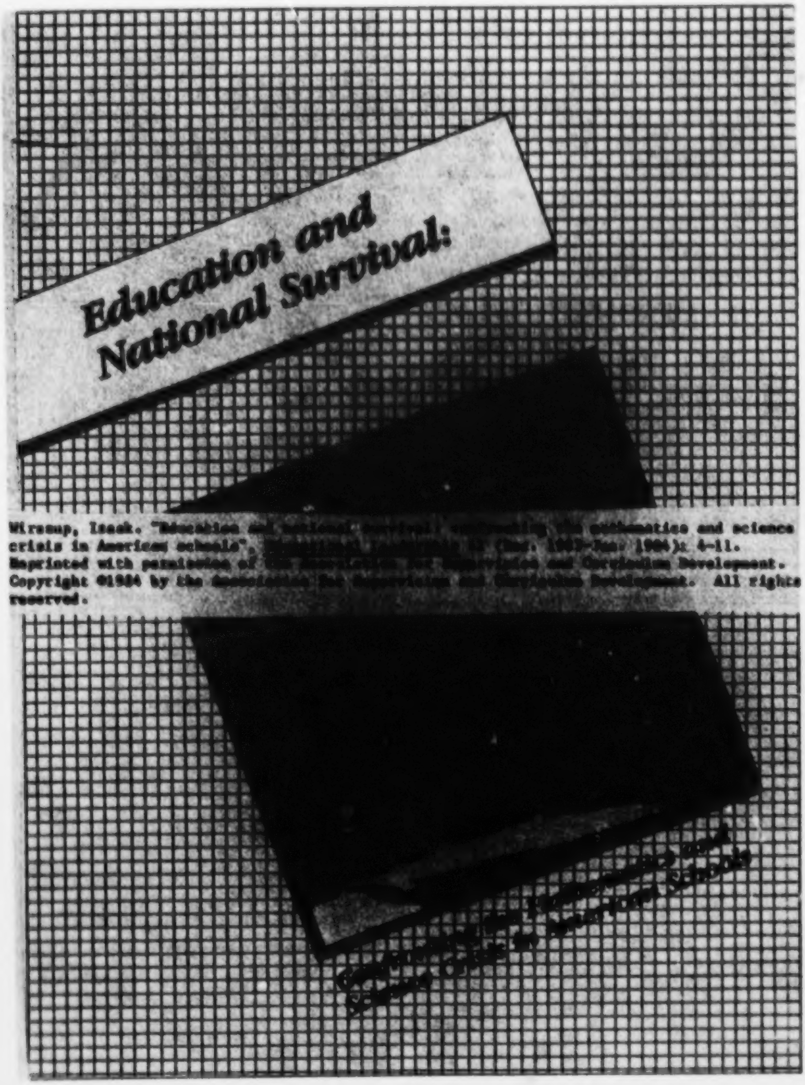
Assessments of Achievement

- Systematic cross-sectional assessments of general student achievement in science and mathematics, such as the ones carried out through NAEP, should be carried out no less than every 4 years to allow comparisons over relatively short periods of time. The samples on these assessments should continue to be sufficiently large to allow comparisons by ethnic group, gender, region of the country, and type of community (urban, suburban, rural, central city).
- Longitudinal studies such as High School and Beyond are important for following the progress of students through school and later and should be maintained.
- International assessments in mathematics and science education such as those sponsored by IEA need to be carried out at least every 10 years.

Tests

- Developmental work on tests is needed to ensure that they assess student learning considered useful and important. Instruments used for achievement testing should be reviewed from time to time by scientific and professional groups to ensure that they reflect contemporary knowledge deemed to be important for students to learn. Such reviews may lead to periodic changes in test content--an objective that must be reconciled with the goal of being able to compare student achievement over time.

- Work is needed on curriculum-referenced tests that can be used on a wider than local basis, especially for upper-level courses. This work will require careful research on the content of instruction, tests constructed with a common core of items, and alternative sections of tests to match curricular alternatives.
- Assessments should include an evaluation of the depth of a student's understanding of concepts, the ability to address nonroutine problems, and skills in the process of doing mathematics and science. Especially for science, it is desirable that a test involve some hands-on tasks.



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Izaak Wirszup

The United States is now facing one of the sternest challenges in its history. Its current poor standing in international comparisons of school mathematics and science achievement has been as paradoxical as it has been painful. On the one hand, the U.S. is still acknowledged to be the world leader in science and technology. It is a nation whose scientific elite for the past 50 years has been in the forefront of research and discovery, a country whose major universities and training programs are the envy of the world and a magnet for students, scholars, and scientists from other continents. America's economic power has converted scientific and technological breakthroughs into top-quality, mass-produced consumer goods and services; its medical achievements have made possible superb health care and offered a model for other countries. The U.S. has also developed a system of civic education that is among the very finest in the world. Nevertheless, American public school education, especially in the areas of science and mathematics, is in dangerous conditon.

Over the past two decades many industrialized nations, such as Japan and the countries of Western Europe, and even emerging nations such as Korea and Taiwan, have recorded outstanding achievements in the education of the general population. Since 1966, the communist-bloc countries have launched an educational mobilization, adopting general education standards and technical training programs of unmatched quality and magnitude. During this same period, the overall achievement levels of American secondary school graduates have not only failed to rise, but actually plummeted. The same downward trend can be seen in literacy and basic skills, where levels which may have been sufficient for survival years ago are totally inadequate in today's world. The well-written but unfortunately understated report of the National Commission on Excellence in Education has provided the latest chapter of documentation for the decline of American schools.

In brief, the educational level of the American citizenry is already having a terribly damaging effect on our productivity and general economy. Furthermore, no matter how much we invest in military technology, educational decline will continue to undermine our national defense.

The many possible solutions to our current problems focus on improved teacher training, a complete redesign of curricula, and a solid, long-term commitment to change efforts.

It is ironic that our school systems are now producing graduates who, in the majority, are intellectually remote from the great American accomplishments in space exploration, nuclear power, computers, and other technological wonders of the 20th century. Today most Americans lack the science training to understand the essence of these achievements, and few can share in the excitement of scientific discovery on any level.

The Educational Crisis

A careful examination of our current educational programs in the light of anticipated educational, economic, and defense needs will enable us to determine what changes must be made in our schooling. The seriousness of our educational crisis was first made clear by comparative studies of American and Soviet mathematics and science education programs. It may therefore be appropriate to review a few of these striking comparisons to illustrate the real enormity of our predicament.

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> **"The vast majority of our high school graduates have not studied physics, chemistry, geography, or a foreign language . . . they cannot even apply basic mathematics and science to simple jobs."**

The current secondary school graduation rate in the Soviet Union is 98 percent, in Japan 95 percent, and in the U.S. only 72 percent. Even more telling than these general statistics are comparisons of programs and enrollments in specific subject areas.

- Of some four million American students who reach the age of 17 each year, at least 70 percent have been taught arithmetic for nine years. Nine years of repetitious drill result in feelings of boredom and incapacity for the students, who usually emerge from a demoralizing arithmetic experience without the inclination or the ability to pursue either secondary school algebra and geometry or technical/vocational training. In almost all other industrialized countries, children complete arithmetic in six years; in the USSR, arithmetic combined with intuitive geometry is taught in five years.
- Only half of our students take as much as one year of plane geometry. Most of these never learn geometry because we attempt to teach it in a single year, while empirical evidence and modern educational psychology tell us emphatically that we cannot. Furthermore, our high school students are not being taught solid geometry. Therefore, they rarely have the workable perception of three-dimensional space that is essential to many areas of science, technical design, and engineering. In contrast, all Soviet students study geometry continuously over a ten-year span: five years of intuitive geometry (at least one hour per week in grades one through five), three of semi-rigorous plane geometry (two hours per week), and two of solid geometry (two hours per week).
- While the great majority of Americans are struggling with nine years of arithmetic, Soviet students are working

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through a challenging and comprehensive compulsory mathematics curriculum that comprises six hours per week in grades one through eight and five hours in grades nine and ten (a total of nearly 2,000 class hours over ten years). In this ten-year period the Soviet program covers the equivalent of at least 13 years of American schooling in mathematics, and does so much more thoroughly and effectively, culminating in a calculus course taught in grades nine and ten.

- American secondary school physics, another building block of science education and technical training, is in extremely poor condition and must be changed radically. Less than a sixth (16 percent) of our high school students take even a one-year course in this discipline, while in the USSR all secondary school students take a compulsory five-year sequence of physics courses. The total number of physics teachers for some 16,000 U.S. school districts is less than 10,000 and shrinking rapidly. The total number of physics teachers in Soviet general education day schools alone is 123,000, and the USSR trains another 8,500 specialized physics teachers every year.
- The pattern continues in other subjects. In chemistry, only a third (33 percent) of our high school students take a one-year course, while all Soviet students complete four years of chemistry, including a full year of organic chemistry. Soviet students also receive six years of compulsory training in biology (compared to the one-year biology course in the United States), one year of astronomy, three years of mechanical drawing, and ten years of workshop and technical training.
- Our educational crisis is by no means limited to mathematics and the sciences. Only 16 percent of our students receive any exposure to geography as a separate subject, mostly in the form of a one-semester course. Geography training has all but disappeared. In the Soviet Union, on the other hand, all students take a five-year sequence of courses in the physical, economic, and political geography of the USSR and the world. The total number of geography teachers in the Soviet general education day schools is 98,000, and 6,000 specialized geography teachers are being trained every year.
- All Soviet children are obliged to take seven years of a foreign language, while fewer than 18 percent of U.S. public high school students study any foreign language, and fewer than 4 percent receive more than two years of foreign language study.
- Soviet training programs for skilled workers and white-collar technicians are based on a general secondary education which includes mathematics, physics, chemistry, geography, economics, international relations, history, and foreign languages and corresponds to at least 13 to 14 years of the best American schooling, achieved by only a small fraction of our own young people.

The vast majority of our high school graduates have not studied physics, chemistry, geography, or a foreign language, and have had only a modicum of mathematics. Not only do they lack a solid foundation for further training, they cannot even apply basic mathematics and science to simple jobs. This results in a personal tragedy of shattered hopes for countless young Americans. It is also a national tragedy, for it diminishes America's overall position in the world and places a tremendous burden on the economy and society, which must bear the staggering costs of unemployment, on industry, which must invest huge sums even for narrow, short-

term training, and on institutions of higher learning, which must provide costly remedial courses.

Some Aspects of the Present Crisis

The condition of American education is an extremely complex but sensitive issue that demands objective and thorough analysis and sober assessment. If we are to root out the sources of our current crisis, our perceptions must not be blurred by wishful thinking, paranoia, or any other predisposition to commend or criticize. With this in mind, let us take a brief look at three areas in which foreign efforts may suggest possible new approaches to the educational crisis in the United States.

Teachers. A country's educational system is a reflection of the entire society in all its complexity—its history, its culture, its aspirations and values. Ours is now producing alarmingly low numbers of competent teachers, particularly in mathematics and the sciences. Noncompetitive salaries and stressful working conditions are largely to blame. But the root of the problem has been widespread public indifference to the quality and status of teachers in the U.S. These circumstances cannot help but have a pernicious effect on all aspects of schooling.

Most of the students now entering schools of education—that is, candidates for teaching positions—rank in the lowest fifth of high school students taking the Scholastic Aptitude Test. Furthermore, possibly as a holdover from the days of the one-room schoolhouse, American elementary school teachers, many of whom have no specialized training, are expected to teach mathematics. This is unfair to the teachers and often very damaging to the children. When the elementary school teacher corps is so poorly treated, poorly trained, and poorly deployed, it is no wonder that their students early on develop negative attitudes, particularly toward mathematics and the sciences.

What has helped to make the remarkable achievements of Soviet mathematics education possible is that, from the fourth grade on, the subject is taught by a specialized mathematics teacher whose training is equivalent to at least a master's degree program in mathematics in the United States. Even elementary school teachers (grades one through three) receive extensive training in mathematics, the sciences, and educational psychology and teaching methodology based on advanced research. The same applies to the teaching of science and other subjects from the fourth grade on.

Educational Psychology and Curriculum Design. The steady decline of American school mathematics education has brought calls for new teacher training, new curricula and materials, and new "technological" instructional media. For reforms to have a lasting impact, however, they must be based on a genuine understanding of the nature and development of the conceptual and cognitive processes involved in learning mathematics.

The Soviet Union has made tremendous efforts over the past 40 years to study the psychological aspects of mathematics learning. This has resulted in a large body of outstanding research and unexcelled levels of mathematics achievement for the general population. Focuses of Soviet research include principles of mathematical conceptualization, problem solving, logical reasoning, programmed instruction, spatial perception, and methods of discerning and developing mathematical abilities.

The Soviet school mathematics curriculum has been designed, developed, revised, and tested over more than a decade with the participation of teams of world-renowned research mathematicians, leading mathematics educators, outstanding teachers, and specialists in the psychology of learning and teaching mathematics.

The Soviets have also proven adept at exploiting foreign educational research. In 1959 a French periodical printed a paper by Pieter van Hiele entitled "La pensée de l'enfant et la géométrie" ("Children's Thinking and Geometry"), one of the most important breakthroughs in the psychology of learning and teaching geometry. Pieter and Dina van Hiele-Geldof, together with their professor, the famous Dutch mathematician and educator Hans Freudenthal, introduced the idea of five levels of psychological development in geometry. The paper went virtually unnoticed in both Western Europe and the United States. I was fortunate, however, to learn from Russian monographs of the van Hiele paper and of significant research and experimentation done by the Soviets on the van Hiele-Freudenthal theory. The Russians had not only verified and refined the van Hieles' work, but had subsequently adopted this theory as a foundation of their new geometry curriculum and their innovations in the methodology of teaching geometry.

Since American students who take the one-year school course generally have no prior knowledge of geometry and are at van Hiele's first psychological level of development, they cannot be expected to master material from the fourth development level.

"Most candidates for teaching positions rank in the lowest fifth of high school students taking the Scholastic Aptitude Test."

As for high school science, many of the individual programs and textbooks for the American one-year physics and chemistry courses that resulted from the post-Sputnik national curriculum reforms are quite modern and comprehensive. Some of them have served a valuable function in training a new corps of outstanding scientists from among our academically superior students. Yet these "packaged" one-year courses are, like our geometry course, written at the highest developmental level, with little regard for the students' learning processes. For the general population, these courses are simply too intensive and thus totally inappropriate. This is one of the main reasons why enrollments in physics and chemistry are so low.

In the Soviet compulsory five-year physics sequence, the student is first offered two years of intuitive, descriptive, and experimental physics two hours per week; then he or she is exposed to physics for three years (three, four, and five hours per week, respectively) at increasingly higher levels of sophistication and rigor. Soviet research in the psychology of learning and teaching mathematics and science has been aimed particularly at achieving this kind of level-by-level mastery. The "packaged" one-year course in physics (attempted only in the U.S.) should be replaced by a multi-year sequence (two to three class hours per week). The same

"As standard measures of academic performance show, our educational system is producing fewer and fewer able students in all fields."

applies to our one-year chemistry course.

Commitment. Some commentators have remarked on the failure of efforts to make lasting improvements in education in the period after Sputnik. If one examines the facts, these efforts have had only limited effect for two reasons above all: these reforms were geared to the more able student, and the impulse was not sustained, perhaps because of the naive hope that a short-range or one-shot effort could solve deep-seated long-term problems. This is in sharp contrast to Soviet or Japanese programs developed over a period of decades.

It takes 20 years to produce a qualified scientist or engineer, of which the first 10 to 12 years of training are crucial. If our public schools cannot attract and hold students to the sciences, a generation of future scientists will be lost forever. Yet, as the standard measures of academic performance show, our educational system is producing fewer and fewer able students in all fields.

Recommendations

The challenge to the U.S. is formidable. Resolving our educational crisis will be an undertaking of unprecedented magnitude. This will mean raising the nation's general level of educational achievement by some three to four years—equivalent to the level already achieved by the Japanese. It will require a sustained effort by all segments of our society, private and public investment, and, above all, imaginative and engaged leadership at all levels of government. Our goal should not be to imitate foreign methods or systems but to conceive whatever new forms of American education are necessary for the continuing growth of our country and its people.

I would make the following recommendations for curricular reforms and long-term structural changes:

- Develop a completely new mathematics program for all children, covering all of arithmetic in the first six years of school. Intuitive geometry should be an integral part of the new program from the first grade on. Introduce algebraic thinking in the last two years of this six-year program.

- Offer all students in grades seven-nine a new three-year sequence in algebra and a separate, parallel three-year sequence in semi-rigorous geometry, each taking two or three class hours per week.

Replace the "packaged" one-year course in physics with a three-year sequence (three class hours per week) developed according to the latest level-by-level theories of learning. The same applies to our one-year chemistry course.

- Introduce a new sequence of courses on "Technology and Engineering" (two to three hours per week), begun in grade nine and offered to all students in all school systems. Whenever possible, the curriculum should combine theoretical and practical studies, ideally using modern, well-equipped shops and laboratories at nearby industrial or commercial enterprises.

- Make optimal use of calculators and microcomputers in the new mathematics program. The ready availability of these tools in the U.S. should be exploited to greatest advantage at all educational levels, starting in the primary grades. In high school, offer separate courses in computer science, statistics and probability, and solid geometry, in addition to the existing courses in advanced algebra and calculus.

- Organize extracurricular programs to develop students' interest in mathematics, science, and technology. These programs should be designed to excite students and ensure the participation of the best teachers and scholars from all school levels, as well as scientists from industry. The programs should be preceded, and then accompanied, by specially prepared literature that makes use of all the available media—books, carefully designed and widely distributed periodicals, and video presentations on tape and disc. The Public Broadcasting System, museums, and other public educational institutions should be encouraged to provide integrated programs and services.

- Organize new programs, and expand existing ones (such as summer programs), for the discovery and training of mathematically talented children from the earliest possible age.

- A prerequisite for all changes, of course, is basic literacy. Innovative courses, sophisticated textbooks, and superior professional guidance will all go for nought if students are unable to read or write. It is therefore essential that we upgrade the graduation requirements for English in high schools to four years. To help create a global perspective and provide the background for an understanding of international relations and foreign cultures, geography (two years), foreign language (two years), world history, and economics should also be included among basic requirements. It might be noted that *teachers* of English in the Soviet Union outnumber *students* of Russian in this country.

- Organize wide-scale professional orientation programs for all age groups, utilizing resources from a range of institutions.

- Organize or expand continuing education programs for adults who need additional training. We must enable individuals to understand and appreciate new developments in science and technology and offer them an opportunity to study in depth. Schools from

"We must go beyond mere recognition of the problem and mount a serious effort, a genuine *national mobilization*, for education."

secondary level up should be used, as well as museums and popular media.

- Allow only specialized teachers to teach mathematics and science courses from grades five on.
- Establish ongoing improvement and retraining programs for primary school teachers, especially those who teach arithmetic in grades 1–4. Inservice and preservice programs should be devoted mainly to teaching content, particularly the fundamental concepts of mathematics and science.
- Expand our research community in the psychology of mathematics and science instruction. If we are to accomplish the curricular reforms outlined above, and stimulate and coordinate research efforts, we must create a national R & D center for mathematics learning (not combined with science). The new center should be established at an institution of higher learning, or a consortium of institutions, selected on the basis of quality and the greatest promise of active participation by a range of outstanding mathematics educators, research mathematicians, and specialists in the psychology of learning and teaching mathematics. Similar separate R&D centers for physics, chemistry, and other disciplines should also be established.
- Institute a program for the development of a literature on teaching methodology for all subjects at all levels of the primary and secondary school system. This literature should address both content of instruction and teaching methods. It should make use of the classroom experience of outstanding teachers, modern research in the psychology of learning and teaching, and the theory and use of instructional materials, including audiovisual teaching aids, calculators, and minicomputers. A comprehensive literature of this kind, developed over a long period of time and continually revised and improved, is being used in all communist countries to assist inservice and preservice teachers. Such a literature is completely lacking in the United States.
- Conduct research on the theory, design, and application of various aids—principally visual—in elementary school mathematics instruction. The premise is that much of the available equipment, both older and more recent, has been rendered obsolete by advances in mathematics and psychology. Even such modern tools as filmstrips and slides must be reevaluated in light of new educational goals and conditions. Newly designed equipment has to be subjected to rigorous experimental testing in schools.
- Seek new ways to come to grips with a tremendous shortage of teachers trained to teach mathematics or science. This will mean an even greater reliance on microcomputers, video, and other technology for computer-assisted instruction. Further, we must make more extensive and intelligent use of our abundant instructional resources by committing ourselves to continuous research and experimentation in the psychology of learning and teaching.
- Greatly expand the system of preschool education. Appropriate teacher training programs should be introduced for this level. Children from the age of three or four should become acquainted in an organized way with the concept of numbers, the basic ideas of geometry, and underlying patterns and relationships in mathematics and science.
- Encourage institutions of higher learning (especially state universities) and their colleges of education to reevaluate their activities, and assume new responsibilities and commitments with regard to high-quality teacher training programs and the establishment of close working ties with the elementary and secondary schools in their area.
- Accompany these comprehensive organizational and curricular reforms with research and development programs, giving special attention to integration of the sciences, particularly in their relation to mathematics. This research should be applied to the interrelationships of subjects and the establishment of a logical order of presentation in school curricula at each level.
- Create permanent national curriculum centers and a national review board in science and technology. These bodies should include the nation's top scientists and engineers with educational expertise, researchers, outstanding teachers, educators, and psychologists. They would supervise the development of new curricula and review the implementation of programs and text materials.

We must acknowledge that an educated population and a well-trained work force are essential to the recovery of our country's dynamic spirit and economic strength. Then we must go beyond mere recognition of the problem and mount a serious effort, a genuine *national mobilization* for education.

This will require creativity, energy, and wisdom. Representatives of every segment of American society, from leaders of industry to concerned parents, are looking for national leadership and a decisive program to resolve the current crisis in our education. Society needs guidance, purpose, and hope. It will then be ready to make a strong commitment to an educational revival. To give up, to procrastinate, or to plan only for the short term would be to mortgage our freedom and our future.☐

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[1] This recommendation was suggested by Benjamin S. Bloom of the University of Chicago.

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Places where things are right

Analysis of the reasons for the success of a number of outstanding high-school programs in physics suggests a set of conditions for creating successful programs at other schools.

Jack M. Wilson and Tim C. Ingoldsby

While the general state of high-school physics teaching in the United States is cause for concern, there are many areas with outstanding programs. These exemplary programs stand out as hopeful symbols of what might and should be done. Excellence in physics teaching is not confined by region or type of community and can be found in large cities, small towns, or rural farming communities.

Although the variations from program to program are great, there are a number of common ingredients found in all. Enthusiasm, visibility, recruiting, fun, excitement, laboratory experiences, computers, a supportive community, local scientific interactions and an interest in the breadth of the science and mathematics experience appear to make up a recipe for outstanding programs, but the key element is an outstanding teacher or teachers.

Although the previous articles in this special issue have demonstrated that the state of physics teaching is quite poor, they have also indicated actions that could be taken to cause improvement. In the following I will demonstrate that excellence in science education is possible in a variety of formats and geographic areas. The abysmal state of physics education may not be cause for despair, but instead could be the motivation required to implement many of the activities discussed in this and the other articles. To do so will require an unprecedented partnership between local schools, industries, government and scientists. To help inspire us to achieve this goal let us look at what is possible.

Conditions for excellence

One thing excellent programs seem to have in common is that the school community values education and feels that a solid mathematics and science background is invaluable for students with widely varying career goals. Some of these schools are "magnet" schools or schools devoted to the single theme of mathematics, science and technology. Among these are the Bronx High School of Science, the Houston Magnet School for Science, and North Carolina's School for Science and Mathematics. Far more common, however, are the general-purpose high schools with strong programs in a variety of areas including science. Some typical examples of the latter include Oak Park and River Forest High School in Chicago (see figure 1), Westside High School in Omaha, Nebraska, Bay City High School in Bay City, Texas, Clover Park High School in Tacoma, Washington, as well as many others.

These outstanding programs are well recognized in the physics community, and universities vie for their graduates. The February issue of PHYSICS TODAY (page 53) describes one high school (Bronx High School of Science) with a generally excellent reputation in which a single graduating class produced two Nobel laureates in physics.

Why do these "islands of excellence" exist? What are the conditions leading to their formation? Can other schools emulate these programs? Answers to these questions have been the goal of a search for excellence in physics education conducted by the American Association of Physics Teachers in conjunction with the National Science

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Teachers Association. While NSTA has been concerned with the broad view of science education, several committees in AAPT have focused on the situation in physics. Willa Ramsey of the Gompers Secondary School Center in San Diego, California, chairs an AAPT committee charged with defining excellence. This committee has identified the following goals for successful physics programs:

▶ Do students with different interests and backgrounds pursue, enjoy and profit from the study of physics?

▶ Do students understand the relation of physical principles as they apply to their personal experience?

▶ Are students able to complete and explain the results of guided experiences related to their physical environment?

▶ Are students able to distinguish between observation and inference, opinion and fact?

▶ Are students able to recognize the important physical principles underlying a given issue?

▶ Can students gather, record, organize and explain implications of data?

▶ Do students understand the nature of scientific "theory," its value and implications?

▶ Is the student encouraged to build a structure of ideas and concepts within the physics course that will help him or her to evaluate the problems of the real world?

Joe Meyer teaches physics of optics at Oak Park and River Forest High School near Chicago; last year over 75% of the school's students were enrolled in a science course. Figure 1

▶ Does the course involve qualitative and quantitative analysis based on estimates, thereby approximating real-world situations?

▶ Do students develop skills necessary for continuing growth and knowledge of science throughout life?

▶ How does the physics program fit within the goals, objectives and philosophy of the total school?

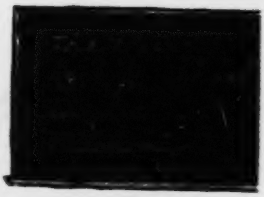
To these goals we would add several other qualifications to be used in the selection of typical examples of good physics programs, such as "What fraction of the student population is reached by the physics program?" and "How have the students fared in further scientific study?"

Magnet high schools

A look at a few of the outstanding programs and the teachers involved should provide a glimpse of what is possible. Comparison of these programs with those found at most schools yield striking results. The "magnet" or theme high schools provide some illustration of what can be done with the best students in a controlled environment that emphasizes science and attenuates much of the distractions faced by science students at other schools.

Bronx High School of Science. When it comes to preparing future physicists, the Bronx High School of Science is the school to which all others are compared. It is the oldest exemplar of the "magnet" school, it still leads the nation in the number of National Merit Scholars produced, and it is nearly always represented in the top groups at the International Science and Engineering Fair, The Westinghouse Science Talent Search and other national and international secondary science competitions.

As mentioned in the February news story, the remarkable class of 1950 at the Bronx High School of Science included two of the three Nobel laureates from Bronx Science, Sheldon Glashow and Steven Weinberg (Leon Cooper, class of 1947, is the third). The list of alumni who have gone on to become physics PhDs from the period 1940 to 1960 is only slightly less remarkable. At a reunion of his class, New York Councilman Henry Stern (class of 1950) said, "There has not been such an assemblage of genius under one roof since yesterday, when the current classes of the Bronx High School of Science let out for the weekend," indicating that the standards have remained high.



In many ways Bronx Science has a very traditional program. Students study for four (sometimes three) years during which they are expected to take science and mathematics every semester. All students are exposed to the study of each of the basic sciences, physics, chemistry, and biology, during their tenure. The particular courses selected depend upon the student's interests and abilities. Freshmen would be expected to take one of the sciences at the introductory, freshman or "double honors" level. The "double honors" course is reserved for the best-prepared students and is a ten-period course instead of the standard six-period course. As in most schools, biology is the most popular choice for the first science, but physical science is increasing in popularity. The sophomore year is similar to the freshman. In the junior year students take regular or honors sections of physics, chemistry or biology and begin a research project in their field of interest. Although a certain amount of equipment is available for research projects, physics students have traditionally undertaken their projects in conjunction with local universities and laboratories. Students also take a course at Bronx Science in the techniques of physics, including an introduction to shop practice. The research projects can be continued into the senior year, which may also include an Advanced Placement course in physics or chemistry; the physics course is taught out of Resnick and Halliday, or Sears, Zemansky and Young.

Admission is determined by the student's performance on a special test. Although interviews were used in the early years, they have since been discontinued. At present the student body of 3100 includes seven percent Hispanic, thirteen percent Black, and sixteen percent Oriental. By graduation, virtually all of the students will have taken at least some physics. Administratively, physics is part of the department of physical science, chaired by Larry Finkelstein. The faculty of eleven is acsigned as part of the normal pool available to the New York City Schools, and no faculty have been specially recruited for service.

Perhaps the most important thing that the Bronx High School of Science accomplishes is bringing together a large number of students who have similar interests and abilities in the sciences. In many other high schools such interests can be overwhelmed by peer pressures from the vast majority of students with no interest in the sciences.

North Carolina School of Science and Mathematics. While the excellent mass transportation available in New York and the extensive use of busing in Houston allow science and mathematics schools at these locations to operate as day schools, the fact that North Carolina's population is chiefly rural and in small cities rules out such an arrangement there. The state thus chose to develop a residential school to provide service to a much larger geographic area. In 1980 the first 150 students were admitted as juniors, and subsequent admissions have brought the total enrollment to 400 in the two-year program.

There are four physics teachers, all with PhD degrees, on the staff. Charles Brittain, a physicist, is the chairman of the science department. According to John Kalena, physics instructor, the residential aspect of the school is very important to its success, because it gives students time for the extended interactions with the faculty they are anxious for. The residential aspect and the fact that faculty are actively recruited rather than assigned are two areas in which the North Carolina school differs from Bronx Science and the Houston Magnet School.

Every student is required to take at least one course in each of the basic sciences, biology, chemistry and physics. To accommodate the different interests and ability levels of the students, introductory physics is offered at three levels of mathematical sophistication. The algebra-level course is taught from one of the standard high-school physics texts, the trigonometry-level course is taught out of the college physics text authored by Giancoli and the calculus-level course is offered from Resnick and Halliday. One major departure from among other schools is the availability of a complete smorgasboard of physics elective courses which include: modern physics, astronomy, electronics, biophysics and energy. Three of these electives are offered each semester. Students fit these electives into a program that requires English and mathematics each year as well as at least one year of history, foreign language, American literature, computer science, and art and music electives.

Selection of students for the North Carolina School of Science and Mathematics is based upon SAT scores, grades, interviews, recommendations and special tests. The school makes an effort to achieve geographic, racial and sexual balance.

Local schools

While the magnet schools undoubtedly do an outstanding job of educating some of the best future scientists in the US, most of our future scientists are studying at schools that do not emphasize science and mathematics. These local schools are trying to maintain a complete variety of programs for an entire spectrum of interests and abilities. Science teachers at these schools have to compete with the football team, the band and the other academic areas for resources, and it is not always easy. Yet these schools are vital to efforts to provide access to scientific and technical careers for the bulk of the population. Ultimately our success or failure at developing a technically literate population and work force depends upon these schools. The following examples of some excellent high-school physics programs may give us some grounds for optimism as well as providing a recipe for success for other schools.

Omaha Westside High School. One of the largest public schools in the state of Nebraska, Westside High School in west-central Omaha serves a population of about 35 000 residents. What began 35 years ago as a small, rural school system for kindergarten through eighth grade has evolved into an urban school district, kindergarten through twelfth grade, with a large (enrollment of 1800 in grades 10-12) and comprehensive high-school program. While not the most exclusive area in Omaha, the Westside community is dominated by upper-middle-class professional people who value education highly. Consequently, over 75% of the students in a typical graduating class will go on to college and will choose a wide variety of colleges. In a typical year, Westside graduates will be accepted by universities such as Harvard, Yale, Stanford, Caltech, Rice and Northwestern, along with prestigious midwestern colleges and universities such as Macalester College, Creighton University and Iowa State. Westside will also send more than 150 graduates to the University of Nebraska each year (and these graduates will account for upwards of 10% of the Regents Scholarships awarded to freshmen by the University).

The physics faculty at Westside is led by department chair Charles Lang. Nearly 50% of the school's graduates will have taken a year of physics, 20% will have completed three semesters of physics and an additional 20% will have credit for at least one semester of electronics.

The strategy adopted by Westside has been described[1] as a "multi-faceted approach" to physics. The physics program is built around a weekly "cycle" of class meetings. The goal each week is to learn a particular topic or set of topics. All activities within a cycle relate to that goal. For efficient utilization of the staff, four separate types of class meetings occur each cycle.

The cycle begins with a presentation to the entire class of 300, requiring a great deal of preparation. At these full-class meetings, the teachers make an effort to involve the students in the classes as participants in demonstrations or other activities. (Some of the full-class meetings are used for administering exams.) When appropriate, large group meetings will be held in locations other than the lecture hall—for example, for the introduction to waves the entire class meets at the swimming pool ("the world's largest ripple tank," see figure 2), where demonstrations of interference, superposition, traveling waves and standing waves take on real meaning to students. Another special meeting, held at the football stadium during the introduction of Newton's Laws, is a demonstration experiment conducted using identically shaped model rockets but carrying different masses and charges (to produce different total impulses). A beneficial side effect of such special class meetings is an increased visibility for the physics course among the entire school population, which teachers in both of these two programs mentioned was important.

Without question, the focal activity for each cycle is the common lab, allowing all students to participate in the investigation of the physical principle under study that week. For example, when they study Newton's Laws, the students' common lab activity is using stroboscopic photography to measure the acceleration of a "dynamics cart." All labs are written up in an abbreviated format and graded by one of the instructors.

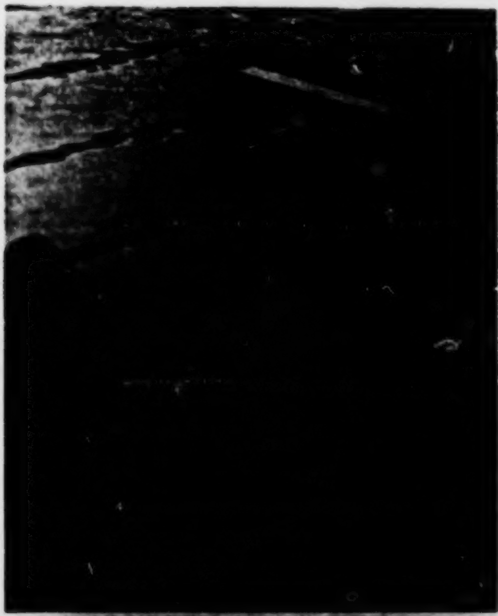
During the week there are two small meetings, limited to about 25 students

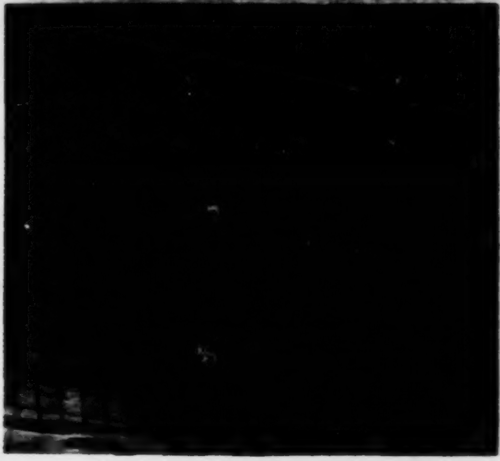
Westside High School in Omaha uses a swimming pool ("World's Largest Ripple Tank") to demonstrate wave phenomena. Half of the students take at least a year of physics.

Figure 2 ▸

Computers at Oak Park and River Forest are an integral part of the physics class and laboratory.

Figure 3 ▸





per section. The first is used for pre-lab discussion, problem-solving assistance and demonstrations that would not be visible in a larger setting. A second small meeting is for post-lab discussion and to summarize the important ideas of the cycle and check for student understanding.

The final activity of each cycle is the primary activity that provides for differentiation among student abilities and needs. All students attend an "interest lab" designed to provide a wide spectrum of additional activities related to the topics of study for the cycle. Students select one or more activities based on their abilities and interests. Topics of study for interest labs are carefully chosen to represent a wide variety of mathematical and conceptual levels.

One final feature of every cycle is a provision that eliminates much of the fear that students often have toward physics. The "Help Room" is a classroom staffed every hour of every day with a physics teacher ready to provide individual assistance to students; students know that a physics teacher will be available in the Help Room ready to help them learn physics.

Not only does the mode of instruction vary from day to day within each cycle, but the instructional approach to a particular unit of study changes throughout the year. Other techniques include open laboratories, student contracts, mastery quizzes and team testing.

The physics program at Westside does not stand apart from the rest of the school curriculum. Students are actively encouraged to take as many science and mathematics (and solid English!) classes as possible. Physics forms the core of the junior-year science curriculum, but accelerated sophomores (those co-enrolled in advanced algebra) and a few seniors also take the course. Over 95% of the physics students continue on to an equally excellent chemistry program, and there is a conscious coordination of topics between the two physical sciences. Fully the last third of the physics class concerns atomic and nuclear physics, which leads well into the atomic model topics at the start of the chemistry course. Also, heat, thermodynamics and kinetic theory are given light treatment by physics but covered in depth in the chemistry program. Another option for seniors is a third semester of physics, which treats topics omitted in the first two semesters but important for scientific careers (field theory, rotational motion, relativity and selected concepts from biophysics and radiation physics). Finally, a full spectrum of electronics courses, taught from a physical viewpoint, is available to students throughout their high-school career. Those completing all six semesters of electronics will have the equivalent preparation (analog and digital electronics, microcomputer programming and interfacing) of many two-year technical college programs. Advanced Placement physics is not offered. The science faculty at Westside feels that breadth of preparation is the proper focus of high-school science; thus, students are encouraged to select a wide range of courses rather than intense study of a single discipline (such as the calculus-based AP physics course requires).

Westside's program has produced a solid record of achievement. For example, the Class of 1983 included 19 National Merit Finalists, a Space Shuttle project finalist and a Westinghouse Science Talent Search award winner. This class of 800 received approximately $500 000 in scholarships.

Oak Park and River Forest High School. Oak Park and River Forest are residential suburbs adjacent to Chicago with a combined population of about 70 000. Excellent cultural and recreational opportunities, with many hospitals and churches, make this community a people-centered place with extraordinary emphasis on its schools. The communities include minority populations of approximately 5.3% Black, 1.8% Asian American and 1.4% Hispanic. Oak Park and River Forest have large percentages (37.7% and 50.6%, respectively) of adults with the occupational status of "professional, manager or administrator," which indicates an educationally oriented population. Historically, the board of education has been very supportive of excellence in education.

The enrollment in the four-year high school is 3329 and the trend is downward (from a peak of over 4400 in the early 1970s). Enrollment is expected to bottom out in about 1985, with a gradual increase foreseen thereafter. The per-pupil cost for education is $3900/year. Certified staff number 256, for a student/teacher ratio of 13 to 1. The main portion of the school building is approximately 50 years old, but many additions and remodelings have been completed since its initial construction. The school district dates to 1873 and claims an illustrious list of graduates, including Ernest Hemingway, John La Montaine and Ray Kroc. Specialized science facilities are limited to a recently acquired greenhouse donated by a district resident.

The physics curriculum at Oak Park and River Forest High School provides offerings suitable for nearly all of the college-bound portion (over 77%) of the school population; it includes Physics 1P, a less mathematical introduction to physics emphasizing the concepts of physics and using Paul Hewitt's text, *Conceptual Physics*; Physics 1, a traditional algebra-level approach to high-school physics using the text *Concepts in Physics* by Miller, Dillon and Smith; Physics 1H, an honors version of Physics 1, using Beiser's *Physics* and designed to prepare students for the Advanced Placement Level B (non-calculus) Examination; and AP Physics, a second course in physics using Sears, Zemansky, and Young for serious science students expecting to take the Level C (calculus) Advanced Placement Physics Examination. Another course taught in part by physics teachers is Freshman Science Survey. This course, newly developed by the science department at the school, is an attempt to provide incoming students with some exposure to the broad offerings of the science department at Oak Park and River Forest. Students receive six six-week units of instruction, taught by different instructors representing the various areas of science education in the high school. During the physics segments this year, students were introduced to problem-solving involving the personal computer (see figure 3) and scientific analysis techniques for solid, liquid and gaseous systems.

All of the introductory physics offer-

◄ Katherine Mays at Bay City High School on the Texas Gulf coast mixes a solution for an electroplating experiment in her physics class. Figure 4

Bay City computer specialist, Sophie [illegible], writes programs that students can use to analyze data taken in the laboratory. Figure 5 ▼

ings of Oak Park and River Forest High School are laboratory-based. While the AP physics course does not have a weekly scheduled laboratory period (the demands for coverage of the topics in the AP physics Level C curriculum do not permit time for weekly laboratory investigations), students are expected to complete quarterly projects that require the development of experimental skills. Project topics for the 1982-83 school year include bridge-building, mousetrap cars and other "physics olympics" events.

There is clear agreement among the administration, other faculty and students of Oak Park and River Forest High School that the prime key to the success of the physics program at the school is the talented, dedicated physics staff, led by veteran instructor Joe P. Meyer. These teachers have worked hard to develop a learning environment that encourages all students to consider physics an exciting subject for study. Some team teaching occurs in Physics 1 and Physics 1H, but throughout the offerings the emphasis is on substance rather than strategy.

Perhaps the overriding characteristic of the science program at Oak Park and River Forest High School is the support shown by science teachers of one particular discipline for the offerings of the other areas of science. No student is permitted to enroll in a second year of a particular science without having taken at least one year of the other basic science offerings (biology, chemistry and physics). This emphasis on *breadth* of preparation, rather than *depth* in one particular area, is a prime consideration in the identification of an outstanding college-preparatory physics program. Nearly 70% of the graduating class of 1981 had at least one year of life science and one year of physical science. More than 70% of the students enrolled in biology as sophomores continued with chemistry as juniors and over 60% of the chemistry students continued with physics as seniors. Including the Freshman Science Survey, in excess of 50% of the graduating class has received at least some instruction in physics. Physics is only one of many science programs with high enrollments. In fact, science, with only a one-year graduation requirement, is second only to English, with a four-year graduation requirement, in terms of course offerings and enrollment! (Over 75% of the student body is enrolled in a science course in 1982-83.)

Any examination of the achievement of students in the Oak Park and River Forest High School physics program indicates a high level of success. Students from the school attend a broad range of institutions, from the most prestigious universities to the local community college. Follow-up studies of graduates indicate overwhelming satisfaction with their preparation in science. Of those students enrolled in Physics 1H and AP Physics taking the Advanced Placement Examination in 1982, nearly 90% received scores of 3, 4, or 5.

Probably the most significant measure of excellence of the physics program is the performance of Oak Park and River Forest High School on the Junior Engineering Technical Society Contest over the course of the past three years. The school entered this competition for the first time in 1979-80. The Oak Park and River Forest JETS Team placed as state runner-up; in 1980-81 the Team was state winner and national runner-up; in 1983 Oak Park and River Forest High School was the national winner. (The JETS competition involves tests in graphics, English, mathematics, biology, chemistry, and physics. Each team member takes only two examinations. Thus, the overall team score is a reflection of the total program, rather than the extraordinary abilities of one or two students.) Oak Park and River Forest has also provided past winners of the Westinghouse Science Talent Search and finalists for the Space Shuttle Project.

Bay City High School. Located in a rural area of the Texas Gulf coast, Bay City High School is well known to the college and university science departments in Texas. Just as some schools have a reputation for producing "blue chip" football players, Bay City has the reputation for producing "blue chip" science students, particularly physics and chemistry students. Although many of the graduates go on to the better known Texas schools, such as the University of Texas, Texas A&M and Rice University, MIT has been known to recruit successfully at Bay City.

The science program at Bay City is typical although somewhat accelerated. Starting as early as eighth grade, students are invited to participate in an after-school science program for roughly four hours each week. In ninth grade the best students are placed in biology so that the last three years are free for the physical sciences. Two years are offered in each of the sciences. Extensive laboratory work is part of each course and a research paper is required each semester.

As is the case with many of the most successful physics programs, an outstanding teacher, Katherine Mayo (see figure 4), can be identified as responsible for much of Bay City's success. Mayo credits a number of her college physics professors with teaching her that she should "not worry about the amount of material covered, but to teach well the concepts introduced." She also points out that teachers should have a love for physics and an enthusiasm for communicating that love to the students. Students describe her lecture techniques as "getting a high on physics." She herself asks "have you ever seen a little old white-haired lady pivot on her toes to demonstrate rotational inertia?" Her classroom has something of a "carnival atmosphere" with numerous devices and demonstrations hanging from the ceilings, walls and covering the tables. Toys, used to introduce many topics in mechanics and optics, are everywhere. Computers are available to all of the physics students; they all learn how to write programs for graphing, data analysis and simulation (see figure 5).

Bay City has an unusually well-equipped science department, and the teachers attribute this to the excellent support that they receive from the school board and administration. There is also a lot of interaction with the community and local industries. Industry and local doctors have donated such equipment as a spectroscope, electrophotometer, balances, pH meters, recorders and a gas chromatograph. The school also calls on local scientists and engineers to act as mentors for special research projects, to assist with field trips, and to teach short (3-5 day) courses in such areas as statistics, data analysis or computer programming. Each year at least one scientist from local industries acts as the liason between the students and other local scientists. During the 83-84 school year five local scientists have agreed to assist by acting as resource people or even by repairing equipment.

Depending upon the year, 35-70% of the graduates will have taken physics. Mayo sees an increase in state requirements as deemphasizing some of the "frill" courses and strengthening the science areas. When asked what is the most important thing that a physics teacher can do, Mayo replied "Recruit, recruit, recruit! I have to let the students know that physics is important and can be interesting. If I do not tell them, no one else will."

Clover Park High School. Just south of Tacoma, Washington, Clover Park High School is another excellent suburban school district with an active program in physics. An enrollment of 1200 students supports a science faculty of six. Over 50% of Clover Park's students go on to college and most of them take two years of science. There are four physics courses offered, as well as an independent study course and an atomic-science course. This year the independent study group is working on a course entitled "The Mechanics of Motion." This entails applying the concepts of classical mechanics to amusement park rides.

The 1982 Washington State Educator of the year, Jack Dombrosky (see figure 6), teaches physics and heads the science department at Clover Park. His example may provide ammunition for those who feel that teachers may be retrained by workshops and institutes of the sort offered by NSF in its early years, because Jack Dombrosky entered teaching twenty-five years ago prepared as a biology teacher.

Then, as now, there was an adequate supply of biology teachers and a short supply of physics teachers. The principal of the local high school told him that physics teaching might be his only chance to get into secondary education. He took that chance. In his own words, "Needless to say, I was very unprepared and learned much physics along with the students."

Fortunately for Dombrosky (and the state of physics education), the launch of Sputnik provided the impetus for major improvements in physics teaching. Through NSF grants and workshops, he was able to obtain an MA in physics, and a later workshop introduced him to PSSC. He still uses PSSC today, although he considers the fifth edition much less useful than earlier editions. Using earlier editions, he had built the course around the question "What is light?"—a mystery approach to be resolved by the end of the course.

Dombrosky echos Katherine Mays' exhortation to "Recruit, recruit, recruit!" His own recruiting efforts effected a dramatic increase in physics enrollments at Clover Park, in the face of a 20% decline in school enrollment. He suggests that one way to recruit students for physics is to survey the biology students to discover students with interests that should lead them into physics. He maintains that "Physics is for everyone, not just the select few."

Like the teachers at the other programs, he tries to make physics visible to others in the building through activities outside the classroom in the halls or even the streets. He runs a version of the Physics Olympics program each spring as a competition between classes. With teachers who proclaim "airplane-flying contests are not physics!" Dombrosky has little patience. He retorts that students "will remember the paper airplane more vividly than they will remember the formula for centripetal acceleration." He teaches by Dombrosky's first law, "Physics is Phun." His students may have fun, but they also learn a lot of physics. Many have gone on to success at prestigious universities. The problem-solving teams he advises have been at the top of the state competitions, and he has high hopes for the national competition in the future.

As the head of the science department, he has had the opportunity to develop teaching strategies for others. Among his suggestions: Encourage females to study physics, don't try to cover everything, encourage note-taking, don't require formula memorization, develop objectives, use tests as teaching devices, use the computer in the classroom, subscribe to *The Physics Teacher* and *The Science Teacher*, attend professional meetings, take field trips and, above all, don't hesitate to try something new in the classroom.

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Education and Technology: Predicting the Needs of the Future

Our perceptions of education seem to be tracing a path similar to that of a pendulum. In times of prosperity and national preeminence, we laud education, broaden our educational offerings, and focus our attention on educational access. During periods of economic distress and national embarrassment, we denigrate our institutions of learning, narrow program options, and concentrate on excellence rather than access.

Because of the current economic decline and the fear that America may be losing its position of technological superiority, much has been written about the need to reshape our educational system to better meet the needs of business and high technology. Representatives of industry, government, and schools warn of the inadequate pool of workers skilled enough to contribute to our technological advancement.

Some find the answer to the problem in the increased allocation of resources to vocational education, career education, studies in science and math, work/study programs, or courses in the use of microcomputers. These answers tend to lead down the path of increasing specialization.

Others argue the merits of a liberal course of study that prepares students to adapt to a rapidly changing society by imparting general skills. Those defending a general curriculum envision the mission of education as offering, in the words of Ted Mills, "a taste of human wisdom, an understanding of inner human needs, the meaning of self-worth." In some cases, the humanist perceives education as compensating for the rigor, tedium, and dissatisfaction characterizing many jobs.

In fact, the desires of proponents of a liberal education and those who argue the advantages of an education more relevant to the workplace need not be mutually exclusive. The differentiated needs of students suggest that the curriculum should be both broad and specialized. In reviewing research on the effects of technology on skill requirements, this article attempts to identify those skills needed generally and those that are peculiar to higher level jobs. It then suggests implications for curricular programs based on these needs.

The Effects of Technology

Technology is substantially altering our lives, especially through the expanding application of microcomputers to all phases of human activity. It would seem

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reasonable to conclude, then, that school curricula will inevitably need to accomodate demands for increased knowledge and skills necessary for the design and use of new technology.

Some social scientists, such as Peter Blau, Wilbert Moore, and Wickham Skinner, have argued that new technology increases the differentiation and specialization of labor and affords workers higher levels of responsibility and skill. Concurring with this judgment are certain economists who point out that the differences in wages for skilled and unskilled workers have narrowed with increasing technology, an indication that technological advancement has upgraded unskilled jobs.

The Center for Educational Policy and Management (CEPM) is directing increased attention to the policy implications of the debate over the contribution of education to productivity. Plans are underway for the Center to participate in a study of successes in secondary educational programs that graduate students with the cognitive skills necessary for further specialized training in occupations involving modern technology. Researchers for CEPM will be exploring the effects of particular educational programs on graduates' employability and initial job success.

The material for this issue of R&D Perspectives *was extracted from a larger paper,* The Contribution of Education to Productivity, *commissioned by the ERIC Clearinghouse on Educational Management at the University of Oregon. Wynn De Bevoise, editor of* R&D Perspectives, *wrote the paper while employed by the Clearinghouse as a research analyst and writer. Readers may obtain information about ordering the full text of the monograph, to be published in March 1983, by writing Editor, ERIC Clearinghouse on Educational Management, College of Education, University of Oregon, Eugene, OR 97403.*

Lynn Grover Glai and Roy Forbes of the Education Commission of the States have recently completed an evaluation of skills needed for our modern society. Based on their study, they have compiled a list of the "basics" that should be mastered by future workers:

- evaluative and analytical skills
- critical thinking
- problem-solving
- organizational and reference skills
- synthesis
- application
- creativity
- decision-making (with incomplete information)
- communication skills (using a variety of modes)

In contrast to the argument that technology raises skill levels, Harry Braverman, Ivar Berg, and others contend that technology may actually lower the skills required in most work. Berg examined the educational requirements for about 4,000 jobs for which educational and training requirements were estimated first in 1957 and then again in 1965. By adjusting these data so that they could be correlated with census reports on the educational achievements of the work force by occupation, he was able to calculate the approximate relationship of educational requirements for jobs to the educational achievements of the American labor force. He concluded that "since 'achievements' appear to have exceeded requirements in most job categories, it cannot be argued helpfully that technological and related changes attending most jobs account for the pattern whereby better-educated personnel are 'required' and utilized by managers."

The desires of proponents of a liberal education and those who argue the advantages of an education more relevant to the workplace need not be mutually exclusive.

Braverman argues that, in the capitalist system, managers find it expedient and cost-effective to fragment and routinize jobs over time, irrespective of the skills workers possess. In fact, Braverman finds that the changing conditions of industrial and office work result in a polarization of the skills possessed by managers and those possessed by workers. It is the managers and engineers who gain upgraded skills and are able to manipulate new technology. Meanwhile, at the other end,

> the more science is incorporated into the labor process, the less the worker understands of the process; the more sophisticated an intellectual product the machine becomes, the less control and comprehension of the machine the worker has. In other words, the more the worker needs to know in order to remain a human being at work, the less does he or she know.

Braverman's concern for the worker as human being raises the issue of job satisfaction and self-concept. Training students for the workplace is not simply a matter of matching skills to jobs.

In many cases, technology has transformed skilled workers into intelligent machine tenders. An example of this transformation is afforded by Western Electric Company's manufacturing plant in Allentown, Pennsylvania. According to a report in *Newsweek*, the plant once housed 700 women who manually assembled transistors in old, airy rooms. Today, workers monitor computer consoles in "clean cells that filter out dust and humidity." In the same article, Robert Lund, assistant director of the Center for Policy Alternatives at the Massachusetts Institute of Technology, observed that as a result of installing automated equipment in one firm, "the skills required went down, but the pay went up." In this case, the salary was determined by the need to attract responsible workers to a boring job rather than by the skills required for performing the work.

In examining a more pervasive innovation, three scholars in Great Britain, Erik Arnold, Lynda Birke, and Wendy Faulkner, have defined the ways in which word processing deskills the job of typing:

> Even typing itself involves varied tasks at present: changing paper, typing, arithmetic for text centering, page layout and so on. Word processors deskill typing tasks by means of such facilities as easy correction, automatic text centering and automatic layout. Thus, while still requiring some basic ability to operate a standard keyboard, word processors dispense with the need for layout skills and high levels of keystroke accuracy.

If technology has the effect of making certain jobs less challenging and more tedious, education may have an important role to play apart from the teaching of basic skills. When work is not satisfying, avocational interests assume greater significance. A broader, more adaptive view of life (the result, many argue, of a liberal education) may provide workers in jobs deskilled by technology with the ability to find other meaning in life.

How do we reconcile, then, the two seemingly opposing views of the skills needed for work in the world of high technology? Both perceptions —that technology requires a higher level of skills and that technology deskills many jobs— seem to be at least partially accurate.

Certainly those who are responsible for the design of technological innovations and those who manage the production of goods and services need to understand and be able to control the machines that are daily changing our lives. And even the average worker in the service-producing industries will need skills that may not be currently required, such as the ability to think critically and manipulate data. The skilled or semi-skilled worker in the goods-producing sector, on the other hand, would seem to require fewer of the skills of craftsmanship that characterize

the accomplishment of labor-intensive work. Rather, employers expect these workers to have a well-developed sense of responsibility and the inclination to follow very specific instructions in tending the machinery of capital-intensive production processes.

Skill Requirements

The review of the literature for this article revealed over and over that employers, in discussing the needs of modern business and industry, are actually emphasizing the need for basic skills, rather than highly specialized or technical skills. When interviewed by Thomas Toch for *Education Week*, Sol Hurwitz, senior vice president of the Committee for Economic Development (a public-policy organization representing 200 major corporations), spoke of employers' concerns about the preparation of students in schools: "There's a widespread feeling within the business community that the schools have failed to produce students who can communicate, who can listen and think, and who can work with other people." Moreover, a report in *School Business Affairs* on a word-processing program offered at a Milwaukee (Wisconsin) high school indicates that students enrolling in the program lacked basic skills required for word processing, such as the ability to spell and punctuate properly, knowledge of proper sentence construction, and the use of correct grammar.

Additionally, in a recent analysis of the impact of new electronic technology on jobs, Richard Riche suggested that the emphasis now is on formal knowledge, precision, and perceptual attitudes. These skills rely on the ability to read and write on a functional level in order to interpret the operating manuals of complex equipment and to facilitate retraining in new skills.

Generally, then, the skills described by these writers, and echoed by business leaders generally, should be mastered at the secondary level. If, indeed, students are graduating from high schools without these skills, the answer would seem to lie in the restructuring of secondary education. In fact, high schools are already under pressure to raise their standards for student promotion and graduation as colleges nationwide consider stiffening entrance requirements.

At the same time that high schools strengthen their basic curriculum, however, they will also need to ensure that highly specialized and technical courses are available for those who need them. Training in such fields as higher math and science, electronics, and advanced computer programming is essential to the preparation of those seeking to become researchers, designers, and managers of technological systems.

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The provision of "elite" classes is perennially at odds with our concept of equity. To prevent the further polarization of skills between workers and managers described by Braverman, careful consideration will have to be given to the question of access to and sequential tracking for these highly specialized classes. In addition, some adjustments will need to be made in the workplace to avoid widespread alienation and dissatisfaction among those in routinized jobs.

Science and Math

Present educational planning attempts to look ahead and evaluate the effects of the computer and other technology on the symbiotic relationship between education and work. Attention has focused on the need for more and better instruction in math and the sciences as a foundation for understanding and using the sophisticated tools of the future. In addition, a smaller, less strident voice is being raised in support of increased foreign language requirements and international studies programs to facilitate two-way communication with a world no longer content to consider English as the only language of diplomacy and commerce. And not least of the needs spawned by the technological revolution is the ability to locate, evaluate, and adapt information to specific purposes. These skills, say many, are imparted through a broad rather than a technical curriculum.

A cursory look at any newspaper or popular magazine today is all that is needed to show that the educational and business establishments and the federal government are concerned about the shortage of graduates in science and math. Of special concern is the need for elementary and secondary teachers trained in these disciplines, particularly in higher math and the physical sciences.

This concern was manifested and given nationwide publicity during the National Academy of Science's National Convocation on Precollege Education in Science and Mathematics held in Washington, D.C., May 12-13, 1982. In his address, which has been quoted repeatedly, Paul Hurd of Stanford University deplored the failure of Americans to appreciate the importance of science and math to economic and cultural progress. He stated that other nations, such as the Soviet Union, East Germany, and Japan, offer specialized instruction in science and math beginning in the fourth grade. Students in those countries spend up to three times as many class hours on the two disciplines as American students.

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An analysis of survey results on the knowledge and skills of American 17-year-old students by the National Assessment of Educational Progress (NAEP) reveals some specific weaknesses in the mathematical ability of the nation's youth. According to authors Gisi and Forbes, from 1973 to 1978 students declined in their demonstration of mathematical understanding, their use of mathematical applications, and their ability to complete multistep math problems. In general, the NAEP surveys suggest that "students have acquired very few skills for examining ideas. Many are capable of preliminary interpretations, but few are taught to move on to extended comprehensive and evaluative skills."

The NAEP results and the higher-level thinking skills required by a technological society that is increasingly devoted to the processing of information point inevitably to needed curriculum reforms. Gisi and Forbes argue that "with technological devices pervading everyday lifestyles, students who are not planning a technical career will need an understanding of the basic principles underlying their operations." By the same token, the thinking, evaluative, and comprehension skills needed for future work are not necessarily covered in a technical course of study. Future workers at all levels will need to understand the workings of entire systems, not just of their specific duties. The increasing interdependency of technology and communications demands that workers approach their work with a sense of perspective and avoid giving too much importance to any one set of responsibilities.

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These overlapping needs suggest the efficacy of providing a basic core curriculum for all students. The emphasis should be on the interrelated nature of multidisciplinary skills. James O'Toole sees a continued, if not more pressing, need for broadly educated workers:

> The problems most people face at work are complex, interdependent, and above all have to do with working with people cooperatively and ethically. Most of the really tough problems that people encounter at work are not technical —the computer can be made to solve those. Indeed, the toughest questions are not problems at all, if a problem is defined as having a single solution. For there are no solutions to the tough policy and organizational problems of work— there is only a spectrum of alternative responses. . . It is such problems that a broadly educated, truly enculturated worker is best equipped to handle.

A Broad-based Curriculum

It is a temptation, in time of crisis or substantial change, to concentrate on one answer to a problem, even in answer to those problems that, according to O'Toole, do not have a solution. Consequently, during the current preoccupation with technology and specialization, it is important to be reminded of those skills found to be productive that are not part of any one discipline.

Gisi and Forbes, O'Toole, Sol Hurwitz, Richard Riche and others previously cited in this paper have reiterated the need for critical thinking skills in workers of the future. Many employers talk in abstract terms about the poor problem-solving capacities of young workers. O'Toole makes an important distinction between problem-solving as we have visualized it in the past and problem-solving as it will be required in the future. He foresees that workers trained in unidimensional problem-solving methods, such as cost-benefit analysis and statistical regression, will become anachronistic as computers take over routine problems treatable by formulaic solutions. Instead of finding tidy answers to recurrent problems, O'Toole envisions future workers facing "intransigent systemic" problems —energy, food availability, unemployment, urban decay— that "cannot be solved by empirical trial and error or reduced to mathematical precision. . . Perhaps it is not problem solving at all that is needed in business, government, and academia, but problem identification and definition."

Adaptability appears to be one essential quality demanded by rapid technological change.

An important attribute identified with a broad education is the ability to adapt to change. Often, the narrowly trained specialist finds such adjustments more difficult than does the more generally trained worker. O'Toole reports,

> Significantly it is starting to dawn on corporate leaders that they need broadly and liberally educated employees. In the last two decades, corporate recruiters and personnel managers have been hiring narrowly trained specialists to fill lower-level openings. While these new hires meet the immediate needs of a firm, as time goes along it becomes clear that they are not promotable. Thus American corporations now are being forced to spend hundreds of millions of dollars on employee education in a not terribly successful effort to prepare lower- and middle-level employees to assume greater responsibility.

Industrialist William Agee has also articulated the need for a wide range of abilities to function competently in the business world. In an address to a national meeting of business educators, he remarked, "I would hope that you are working hard at producing more than a student of business. Clearly, managers of the eighties must be political animals. . . The business of business today is the whole sociopolitical economy."

The Role of Vocational Education

During the current recession, marked by declining productivity growth and unprecedentedly high levels of unemployment, interest has grown in the roles vocational education and other alternatives can play in reversing both of these trends. Gene Bottoms, executive director of the American Vocational Association, sees the new Job Training Partnership Act as giving added support to vocational education. The resources of local vocational programs, he contends, are the "logical choice for serving the economically disadvantaged," who comprise a disproportionate share of the unskilled and unemployed labor pool.

Support for the status quo in vocational and career education programs, however, will not be sufficient. Several researchers have questioned the effectiveness of vocational programs and others have detected socioeconomic repercussions that operate counter to the goals of educational equity.

Shortcomings in vocational education as currently conceived include its often narrow focus on training in specific skills and the frequent neglect of affective and thinking skills valued by most employers. In *Work in America*, written by O'Toole and others, Beatrice Reubens reported the results of an evaluation showing that the initial employment record of vocational graduates —in terms of income, job status, turnover, upward mobility, unemployment rates, and job satisfaction— is no better than that of students graduating from academic programs. This may partially be explained by the argument that skills taught in vocational programs are not general enough for use in a rapidly changing world and are often obsolete before the students secure their first jobs.

Additionally, O'Toole has found that vocationally trained workers have difficulty adapting to the more democratic forms of self-management that are expected to pervade American industry in the future. He sees an inadequacy on the part of these workers in dealing with nonroutine conditions and contends that employers will require more "analytical and entrepreneurial skills, people who know how to solve problems, and people who will not panic when something untoward starts to occur at places like Three-Mile Island." Moreover, he continues, "People who are vocationally trained to unquestioningly perform a single task are manifestly unprepared to design their own work, participate in decision making, assume control over their own working conditions, work as members of a community of equals, or take responsibility for the quantity and quality of their own work when a boss is not looking over their shoulders."

Approaching the subject of vocational education from another perspective, John Goodlad, dean of the UCLA Graduate School of Education, has studied the distribution of secondary curricular opportunities compared to the distribution of teachers by specialty. His findings, to be published at the end of February 1983 in a book entitled *A Place Called School*, indicate that there is enormous variability in the assignment of teachers and that vocational education teachers comprise a disproportionate share of the teaching force —24 percent in senior high schools. In some schools, vocational education teachers constitute over 40 percent of the teaching force.

According to Goodlad, vocational education enjoys curricular luxury as a result of this distribution. Vocational teachers teach their specialty while English, math, and social studies teachers are "spread all over the place." He attributes the inconsistent allocation of the teaching force to the fault of omission rather than to conscious design.

In response to this forceful indictment, others suggest that vocational education, offered as a choice rather than a necessity may help to keep students who are not academically inclined from dropping out of school. Concurrently, they express the need for a modern program of vocational education to provide skills for those having little interest in or aptitude for academic work. And although Russell Rumberger of Stanford University has found that for students who do not attend college, differences in high school curriculum appear to have little effect on employment opportunities, he did determine that there were payoffs to certain specific vocational programs when the training was actually utilized in later jobs, especially in programs training for office occupations. He concludes, therefore, that both vocational and academic curricula show positive results in specific circumstances.

There is a pressing need to evaluate the type of curriculum that will best prepare students not for specific jobs but for a range of tasks that will be required by society and industry in the near future.

The National Center for Research in Vocational Education at Ohio State University has investigated the effects of participating in a vocational curriculum. In 1981, research staff at the center examined almost 1,500 studies covering such topics as earnings, employee satisfaction, academic achievement, and basic skills attainment. The literature surveyed indicated that a majority of vocational education graduates found employment related to their technical training, particularly in the fields of business, office, and health education. In addition, vocational graduates were found to be confident in their skills.

There is also evidence that vocational educators are interested in incorporating more general skills, such as those O'Toole emphasizes, into their programs. Stuart Rosenfeld, director of research and programs for the Southern Growth Policies Board in Research Triangle Park (North Carolina) refers to a "generic" approach to vocational education that results in a closer connection to the regular secondary program. According to Rosenfeld, vocational agriculture exemplifies for some a successful model encompassing less specialized and more integrated training. He states that by "combining farming, business, and problem-solving skills with strong leadership training, vocational agriculture has contributed to large gains in productivity."

Conclusion

Technology has substantially affected our perceptions of how much education is desirable or required to keep pace with current and forecasted changes. Some researchers suggest that skill levels are rising and will need to continue doing so. Others argue that the actual skill levels required for technological work are lower than those required for manual work. Both arguments support the notion that human knowledge and skills are important determinants of economic productivity, but they differ over the types of skills that should be stressed in schools.

Those who believe there is a shortage of job-specific or highly specialized skills give impetus to the movement toward more vocational training in the schools. On the other hand, those who believe that work in general is becoming deskilled emphasize the importance of a broad course of studies to develop the potential of the whole person. They see vocational training as a way of narrowing student competencies and lowering expectations, in other words, of tailoring the skills of workers to the requirements of the workplace without concern for other human needs.

The evidence presented here is not intended to suggest that every student should become a generalist. What it does indicate is a pressing need to evaluate the type of curriculum that will best prepare students not for specific jobs but for a range of tasks that will be required by society and industry in the near future.

Adaptability to change appears to be one essential quality demanded by rapid technological change. Educators must consider to what degree a curriculum that is becoming increasingly specialized at the secondary and postsecondary levels will produce workers who are flexible and able to adjust to continuing transformation in the tools and conditions of work.

The other skills identified as important to modern society—analysis and critical thinking, organizational and reference skills, creativity, and the ability to communicate interpersonally and internationally— call for general training in addition to specialized training. The former should furnish a foundation for the latter. Therefore, the core curriculum that is designed to provide this general foundation should be emphasized in the formative elementary and secondary years and protected from encroachment by peripheral studies. At the same time, high schools will need to prepare a sufficient cadre of highly skilled students in technical fields who are college bound, for our society requires not only competent users of technology, but also technological innovators at ease with complex systems.

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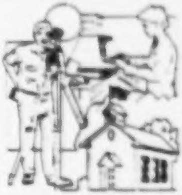

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The Reform of Science Education: A Cautionary Tale

THE THREE FULL DECADES since World War II are an intriguing period in the history of American education, for it was during those years—the fifties through the seventies, roughly speaking—that the federal government made an extraordinary effort, unprecedented in scale, to involve itself in educational affairs for the purpose of improving the quality of schooling for a significant portion, if not all, of our nation's youth. These federal incursions into school affairs involved all three branches of government, and were expressed in judicial decisions, legislative acts, executive orders, and the policies of funding agencies. In one way or another, the impact of these efforts has been felt throughout the land, but the persons most directly affected have obviously been America's youth—the millions who have passed through our schools since World War II, those who are there now, and the untold numbers yet to attend.

Few parts of this vast governmental undertaking are more worthy of attention than the team projects whose goal was the production of new curricular materials in the key school subjects. These endeavors, commonly referred to as THE curriculum reform movement, even though reform efforts of a different sort had gone on before and have since, enlisted the talents of some of our nation's leading scholars, scientists, and mathematicians in the cause of precollegiate education, an event unique in our time. But they have now ended, or at least have come to a standstill. This seems like a natural time, then, to take stock of the accomplishments and to ponder where we might go from here.

The remarks to follow are my version of such a stocktaking. They are divided into four parts. The first is an attempt to place the curriculum reform movement within a broader context than that of curric-

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ulum alone, by relating the reforms to the total scope of federal intervention into educational affairs. The second presents some bare facts about the reform movement, having to do chiefly with the cost of the endeavor and with its actual accomplishments or its failures. The third deals with why things did not work as well as expected. The fourth takes up the question of where we go from here.

At the risk of oversimplification, federal efforts to improve our schools may be depicted metaphorically as moving in two different, but not opposite, directions. Rather, their separate tracks seem to me to be a right angle, one of whose sides is horizontal and the other vertical.

Insofar as ultimate goals are concerned, the horizontal movement of federal effort is toward equity and social justice; it symbolizes a spreading out and an evening up of goods and resources, like hands smoothening the wrinkles of a sheet or a baseball umpire gesturing a safe play. The vertical direction of federal strivings is toward excellence and heightened achievement. Like the lift-off of a rocket, its upward thrust symbolizes a going after the as-yet unattained, a probe into the unknown.

Examples of federal activities classifiable in these terms are so abundant that even the proverbial man-in-the-street could probably name several if asked. Civil rights legislation and the space program are of course the most obvious exemplars of horizontal and vertical movement. The fact that not all federal projects are as easily placed at right angles does not invalidate my point, although it does complicate it, as we shall see later.

Even within the somewhat restricted domain of federal interest in education, examples of horizontal and vertical movement abound. *Brown vs. Board of Education*, which initiated school desegregation programs, is surely the preeminent instance of horizontal movement, although the various congressional decrees that, for example, established the right to bilingual instruction, mandated the mainstreaming of handicapped students, and protected the rights of young women in school athletic programs are not far behind. All such governmental actions can, in the framework I propose, be seen as a reaching out to individuals and groups who heretofore had been treated unfairly by our school system.

Vertical movement would include scholarship programs for the training of scientists, special provisions for the education of gifted students, summer workshops to upgrade the mastery of science and mathematics of classroom teachers, and of paramount importance for my argument, the production of new curricular materials to replace those whose content or method is judged to be lagging behind the advance of human knowledge. The first point to be made about the curriculum reform movement, therefore, is that in my scheme, it is closer to the vertical axis than to the horizontal, closer, that is, to the line of force pointing in the direction of academic excellence and quality than to the one pointing toward social equality and justice.

The significance of this placement for understanding the past and forecasting the future of federally funded curriculum reform efforts increases with two additional features of the horizontal and vertical dimensions. The first has to do with the relative status of these two pathways of action within the federal establishment and the nation at large; the second, with compromise, conflicts, and other forms of interaction between the forces working in the two directions.

If we could somehow place into one or the other of our two categories all those federal activities bearing on educational matters—from judicial decisions to grant solicitations—I have no doubt that the horizontal container would be filled to overflowing long before the vertical made it to the halfway mark. It is crucial to keep this imbalance in mind as we strive to place the curriculum reform movement within the larger context of federal interest in education.

Despite the publicity the reforms enjoyed as they got under way, the money spent, and the retrospective attention paid to them today as educators try to figure out where to go from here, the curriculum reform movement, as initially conceived and executed, was located outside the mainstream of federal concern with education. And that stream, for quite some time now, has been moving horizontally rather than vertically.

Readers familiar with the details of several of the programs under consideration will probably complain that my depiction of federal involvement in education is far too simplistic to fit the facts, and may even be a hindrance to understanding. True enough. All metaphors are of limited usefulness, and mine is no exception. Moreover, given that the government can—and does—move in two directions at once, the directions need not inevitably be at right angles. They could in fact lie much closer to each other—at an angle of forty-five degrees, let's say, rather than ninety. Moreover, that some governmental activities seem to be moving toward both goals at once provides some justification for narrowing the angle's width.

Two examples of such a blending are the government's efforts to attract more women and minorities into scientific careers and its support of a social studies project aimed at producing textbooks that contain a fair and just treatment of the contribution of minorities to American life. In both instances, the goal is neither equity nor excellence alone, but rather a mixture of the two.

Though there are many instances of such doubling up of purposes, there remains, nevertheless—at least in principle—a kind of natural tension between these two ends of human action. This tension is particularly evident when resources are scarce. At those times, advocates of either policy become more protective of their own interests and less willing to compromise.

Within the federal government, this tension gets worked out in several ways. It is significant that most of the curriculum reform efforts, except for those in foreign languages and English, were initiated by the National Science Foundation (hereafter NSF) rather than by what was then the U.S. Office of Education (now a department) or its field stations, the regional labs and centers.[1] The curriculum development work that does go on within the latter set of institutions is much less ambitious than the efforts in the curriculum reform movement proper, and is much more oriented toward the goal of equity than toward improving the quality of curricular offerings in the conventional school subjects.

The placement of curriculum reform efforts within NSF underscores my point about those efforts being closer to the vertical axis than to the horizontal on our hypothetical grid. For NSF is without doubt the institutional embodiment of the federal concern with intellectual excellence, at least insofar as it is manifested in scientific inquiry and research. Other federal organizations, such as the National Institutes of Health, the National Institute of Education, the National Endowment for the Arts, and the National Endowment for the Humanities, are also concerned, each in their own way, for the furthering of excellence in one form or another. But in the minds of many, NSF remains the bastion of all such efforts.

The curriculum reform movement, it seems clear, was almost from the start located off to one side of the dominant drift of governmental action. During the period when the earliest of such efforts were initiated, in the mid-to-late fifties, our national anxiety about keeping ahead of the Russians set a competitive tone that for a time placed excellence, at least in the sciences, ahead of equity. But by the time the reform efforts were in full swing a decade later, that earlier mood was gone, and the turn toward issues involving social reform had already taken place.

This off-to-the-side status of the curriculum reform movement is especially germane to the question of whether and how such a movement could be undertaken anew. It seems evident, from my brief overview, that this would require, at the very least, a major shift in governmental policy. Whether such a shift is currently under way is a question very much in the forefront of today's political analysis and debate.

So much has been written and spoken about the curriculum reform movement that even those who have had no direct or secondhand contact with any of the so-called new curricula have at least a vague notion of what they are like. Thus little need be added here to what is almost common knowledge. One widespread misconception, however, needs correction, before I attach a few numbers to a familiar set of generalizations. The misconception has to do with when the reforms began. Contrary to popular belief, *Sputnik I* did not start it all. A brooding dissatisfaction with what our schools were doing, combined with a deep worry about the educational accomplishments of the Russians, had been troubling the leaders of our scientific community long before the end of World War II. The seminal document in which such concerns were first voiced was Vannevar Bush's report to the president in 1945, "Science—The Endless Frontier."[2] This document, which had been commissioned by President Roosevelt in 1944, provided the basis for the founding of the National Science Foundation in 1950. It established beyond dispute an urgent national need to improve instruction in science and mathematics at all levels of education. In response to that need, summer institutes to upgrade the scientific and mathematical knowledge of high-school teachers were begun in 1954, and a grant to develop a new physics curriculum at the high-school level, the first award of its kind, was given to Jerrold Zacharias of M.I.T. in November 1956, almost a full year before *Sputnik I* streaked across the sky. Though that famous Russian achievement, and others soon to follow, certainly helped to speed the curriculum reform movement along, chiefly by loosening the federal purse strings, such events cannot be credited with getting things under way.

Some idea of just how rapidly NSF became involved in curriculum development and how extensive that involvement became is revealed in the following statistics. In 1954 NSF's total budget for curriculum development was $1,725. In 1955 it was $15,000. Two years later, in 1957, it had jumped to $500,000, and two years beyond that, in 1959, it had increased tenfold to just under $5.5 million. By 1968, the peak year of funding for curriculum development within NSF, the budget for that activity was just under $12,250,000. The total amount spent by NSF to fund fifty-three separate curriculum development projects from 1954 through 1975 was slightly more than $117 million.[3]

That sounds like a staggering amount of money, and by most standards, it is. Yet when placed beside the $100 billion plus that we spend on operating our elementary and secondary school systems each year, or even compared to the federal share of that amount, which is close to $6 billion a year,[4] $117 million loses its punch. It is still a lot of money, but not when compared with our total educational expenditures during the period when it was spent, and would hardly count as start-up funds today for some of the more ambitious aspects of our space program or defense needs.

What has the expenditure of those monies yielded? How have the schools changed as a result? The answers are not easy to give, for schools and what goes on inside them are notoriously difficult to study. When the classroom door is closed, as cynics are fond of putting it, no one knows for sure what is happening within—sometimes not even the teacher!

Yet fragmentary evidence concerning the impact of the curriculum reform movement *has* begun to emerge, much of it coming from three studies sponsored by NSF itself. The first is a national survey of teaching practices, including curricular adoptions;[5] the second, a collection of case studies involving intensive classroom observations at eleven school sites across the country;[6] the third, a review of the literature on the status of precollegiate science, mathematics, and social studies during the twenty-year period beginning in 1955.[7] In addition, the National Assessment of Educational Progress (NAEP) has published two reports on the scientific knowledge and the attitudes toward science of a national sample of nine-, thirteen-, and seventeen-year-old students, together with parallel data from a sample of young adults.[8] There have been countless smaller studies as well, many comparing students who have been exposed to one or another of the "new" curricula, with those who have been taught the same subject more traditionally. Using newly developed techniques of meta-analysis, a few investigators have recently begun to pore over the results of these small, comparative studies, in search of trends that might be overlooked when each is looked at singly.[9]

An additional set of smaller studies has attempted to tease out what might be called the secondary effects of the curriculum reform movement, including such things as the research it has spawned and its impact on commercially prepared materials.[10]

The picture that emerges from all we know so far is mixed. On the positive side, many of the federally funded materials have found their way into the nation's schools, especially science materials, as contrasted with materials in social studies and math. The NSF-sponsored survey, for example, reports that well over half of the school districts sampled were using at least one of these materials in grades seven through twelve, and 40 percent were using more than one. Usage figures are somewhat less for the elementary grades, but even at these lower levels, more than 30 percent of the districts reported using at least one of the federally funded curricular materials in the 1976-77 school year.[11]

Unfortunately, these figures do not tell us what percentage of students actually work with the materials or why adoptions were made in some districts but not in others. Nonetheless, the solid numbers these surveys supply show that the adoption of federally funded materials is rather widespread, particularly in the sciences, and especially at the higher grade levels.

And the secondary effects of these materials are evident here and there throughout the system as well. Among the most noticeable are the changes made in commercially produced textbooks. One study reports that from 1965 on, close to 70 percent of the changes made in *Modern Biology*, the most popular high-school text in the field, were made to conform with the model offered by materials emanating from the BSCS (Biological Science Curriculum Study) teams, the federally funded project in biology.[12] These changes reflect not only the updating of factual content, but also the shifts in relative emphasis given to various concepts within the field, and an increased emphasis on student inquiry and laboratory work in the learning of biology. So there is clear evidence that the federally sponsored projects on the teaching of biology pulled the commercial textbook establishment along with them, at least part way. Though hard data are still lacking for other parts of the curriculum, a similar pattern of influence will no doubt be found there.

From the hundreds of small studies that compared student performance on the "old" and the "new" curricula, the evidence finally emerging, via meta-analysis, says that students who studied the new curricula gained more knowledge and skills on average than did their classmates who took the traditional courses, and that the former also developed better attitudes toward science.[13]

But tucked away among the statistics that convey the good news are more sobering ones. For example, though federally sponsored materials were in use within the schools by the mid-seventies, no single project was in use in more than 25 percent of the districts surveyed, not even within the secondary schools, where the adoption rates were highest.[14] Moreover, only one set of materials—Introductory Physical Science—reached that level. Most other sets were found in no more than 10 or 12 percent of the districts.

With the possible exception of the three texts produced by the BSCS project, none of the federally funded projects could compete in popularity with the most successful commercial texts. In 1974, for example, *Modern Chemistry*, published by Holt, Rhinehart, and Winston, was used by about 50 percent of the students studying chemistry.[15] Even at its peak, the federally sponsored *CHEM* did not come close.

The story in math is even more discouraging. None of the materials in that subject ever fared as well as did those in the sciences. In 1977 no federally funded math materials were in use in more than 5 percent of the districts surveyed.[16] It should be emphasized, however, that these statistics say nothing about the secondary impact of the mathematics projects, which at least one leader in mathematics education claims to have been considerable.[17]

To round out this discouraging picture, the NSF-sponsored survey shows that the adoption rates for the federally sponsored materials peaked in the early 1970s and have been on the decline ever since;[18] it shows, too, that the percentage of students enrolled in high-school biology, chemistry, and physics also peaked at about the same time, and is now less than it was a few years past.[19]

At the elementary level, these materials seem to be even less well established than in the high schools, perhaps because science and social studies have never occupied a prominent place in the elementary school curriculum. One study, for example, reports that not until the fourth grade do students spend more than twenty minutes per day in science and social studies.[20] Even in grades four to six, only slightly more than a half hour per day is spent in those subjects.

But this does not tell the whole story, for in mathematics, a subject that *is* prominent in the lower grades, the federally sponsored materials do not appear to be in wide use. Only 8 percent of the school districts surveyed reported using one or more such materials.[21]

When we add to these statistics the squeeze that the "back-to-basics" movement has put on the time available for science and social studies in the elementary curriculum, together with the insistence on accountability and competency-based testing, we find we have small cause for cheer.

Yet the statistics on adoption rates are not the only source of worry. There is also the question of which aspects of the new programs are being adopted. The goal of most of those programs was two-pronged: to update the content of the subject matter, bringing it in line with what is now known about scientific matters, while at the same time introduce students to the process of science as actually performed by its practitioners. This second aspect called for the extensive use of laboratory equipment and other forms of "hands-on" experiences, and the term "discovery method" was thus an altogether appropriate label for this set of pedagogical strategies.

The little we know about how the materials are actually being used in the classroom suggests that one half of this two-pronged goal is being partially fulfilled and the other not. Today's students are now being exposed to content that is more factually correct, in the sense of being closer to what leading scientists claim to know, than was true in the past; yet the new material is still being taught in "old" ways, with an emphasis on recitation and the memorization of facts.[22] The notion of science as a process, a *mode* of inquiry, seems not to have caught on, even among those using the inquiry-oriented materials. Paul Hurd, a leading authority in science education and one of the authors of the BSCS materials, summarizes the problem succinctly: "For most teachers, science is still a noun, not a verb."[23]

The final note in this report on the downside of the curriculum reform movement is that of public controversy, especially over the inclusion of sensitive topics, such as sexual reproduction and the theory of evolution, in some of the instructional units. The storm of criticism over the publication of the social studies project *Man: A Course of Study* led to soul-searching within NSF, and contributed significantly to the curtailment of congressional support for curricular projects.[24] It would be an exaggeration to say that such criticism sounded the death knell for the curriculum reform movement, but it clearly contributed to the gloom now felt by many of its early enthusiasts.

Paul Hurd, for one, describes the curriculum field as being "in the doldrums."[25] Jerrold Zacharias, the first and perhaps best-known participant in the reform movement, speaks of "today's deadening sense of frustration and near defeat," and laments "the present atmosphere of despair and confusion."[26] Thus, whatever else might be true of the curriculum reform movement, one disheartening conclusion seems incontrovertible: it did not live up to expectations.

Although reform movements throughout the ages have never accomplished all that their designers had optimistically, perhaps unrealistically, hoped for,[27] a close look at the curriculum reform movement reveals that things did not work out as planned for at least three major reasons intrinsic to the movement itself: (1) the level of difficulty of the materials produced; (2) the complexities of their dissemination; and (3) the ambiguities surrounding federal policy with respect to curriculum development.

The most common charge leveled against the new curricular materials—hence, the most popular explanation of their low adoption rates—is that many were simply too difficult for teachers to teach and for students to study. The problem on the teaching side was twofold. First, many teachers, particularly in elementary and junior high schools, but including many in high schools as well, did not have sufficient training in science and math to handle the new materials.[28] Although the special in-service training programs and summer institutes that were created to address this problem had some small success,[29] the lack of teacher preparation continued to militate against the widespread adoption of the new materials.

Second, the new curriculum placed heavy emphasis on so-called discovery methods, many of the projects calling for active student involvement in the learning process far beyond their usual participation in the typical question-and-answer exchange with the teacher. Materials were to be handled, experiments conducted, projects undertaken. The orchestration of all these activities in classrooms with twenty-five or more students, it was claimed, was simply too much for the average teacher to handle. Another commonly heard complaint was that the materials were given directly to practicing teachers, rather than to "teachers of teachers," thus effectively skirting the teacher education establishment whose so-called methods courses were commonly lampooned and sometimes pointed to as the source of much of the difficulty. Newly trained teachers thus entered their classrooms totally unfamiliar with the materials awaiting them.

And there were, of course, the usual assortment of mechanical problems. Equipment had a way of breaking down or being lost or vandalized just when it was needed most. Beyond the pedagogical frustrations occasioned by such breakdowns and losses, there were the costs of repair and replacement, which often turned out to be prohibitive.

On the learning side, the chief complaint was that most of the high-school curricula were designed for college-bound students—and extremely able ones at that—and principally for those headed for scientific careers. This "preprofessional" cast made many of the materials unfit for students of only average ability, and unattractive to those whose interest in science was not very keen to start with. Even the materials for the elementary grades, the complaint continues, were beyond the reach of the average youngster, to say nothing of those below average.

Given the scientific community's concern about the nation's future supply of scientific talent, the intellectual brillance of many of the scientists who worked on the materials, and the virtual absence of educational practitioners on the project teams, it is easy to see how this bias was built into the material. And when practitioners did offer suggestions to the scientists, they were not often heeded.[30] At the high-school level, the problem was exacerbated by an elective system that allowed students to opt out of "tough" courses. Thus, whether the new material was really as difficult as claimed is partially beside the point. That many students *perceived* it as being too demanding very likely contributed to its relative lack of success.

A second reason more of the materials did not find their way into classrooms grows out of the failure of those in charge to comprehend the complexities of schools as institutions, and in particular, their unawareness of how curricular decisions are made in most schools. Thus they believed—naively—that the materials' unusually high quality, to say nothing of the intellectual prestige of many of the project team members, would be reason enough to ensure their adoption.

Seldom did any of them venture to assess such matters as statewide textbook adoption policies, the competitive pressure of the textbook industry, the impact of standardized testing programs and college admissions policies, the role of the school administrator as a catalyst or inhibitor of change, the conservative influence of teacher certification requirements, and so on.[31]

Nor were they prepared for the resistance that would be encountered, both within the schools and from the public at large. The controversy that flared up over *Man: A Course of Study* was only the most dramatic instance of public resistance; there were as well a great many complaints over the inclusion of evolutionary theory and sexual reproduction as topics in some of the materials. Flare-ups would have occurred in any event. It is just that, having failed to test public opinion, both the curriculum-makers and the funding agency were caught completely off guard by the attacks, stunned by the fact that anyone might seriously object to what they were doing.[32]

This surprised reaction to controversy on the part of the funding agency, together with a certain awkwardness in dealing with it, is symptomatic of a deep and fundamental uneasiness about whether curriculum development is the business of the federal government at all. Thus, ambivalence on the part of government leaders is yet a third explanation for the somewhat limited success of the curriculum reform movement. Many government leaders wanted very much to contribute to the improvement of our nation's schools. Yet many others wanted—just as strongly—to avoid governmental meddling into what they believed were the most private of all affairs, the mental states—including knowledge, skills, and attitudes—of citizens, especially the young. The very notion of a national curriculum, with its Orwellian threat of thought-control, was a spectre that haunted them.

Thus the problem became one of accommodating these conflicting hopes and fears. Within the curriculum reform movement, the solution to that problem took many forms, none more interesting than the federal approach to the question of how to disseminate the materials without at the same time foisting them on an unwilling public.

One solution was to fund not one, but several different projects within each subject matter area. This would allow potential users to choose from among a set of competing materials, thus avoiding any suggestion that the government was forcing a curriculum on the schools, while at the same time acknowledging that there *was* more than one way of presenting a subject like biology or chemistry. The rationale for this approach is succinctly stated in an NSF brochure advertising the projects under way. "Decisions on what to teach," the brochure announced,

> remain in the healthy American tradition an exclusive responsibility of individual schools and teachers. The National Science Foundation does not rec-

ommend the adoption of any specific book, film, piece of apparatus, course or curriculum. It is hoped, however, that the products of these projects will prove to merit serious consideration in every school and college.[33]

Though it might have been based, as claimed, on "a healthy American tradition," the government's position was difficult to maintain all the same. To behave as the government thought proper was somewhat like acting the shy salesman, who sets his wares out and then retires to the checkout counter, where he awaits his customers. If, in the meantime, someone should ask him about the merits of this or that product, the poor fellow can but shrug his shoulders and smile. All he can say is that everything in the store is of uniformly high quality.

An additional source of ambiguity and confusion had to do with who would produce and distribute the curricular materials. Given our high regard for the free enterprise system, "the American textbook industry" may seem like the natural answer, but it made government officials nervous for several reasons. They worried about companies making large profits from the sale of materials whose initial development was paid for by taxpayers. At the same time, they did not want to do anything that might prohibit the making of a fair profit, for fear that commercial firms would lose interest in the project. Also, they were reluctant to interfere with the unconstrained play of market forces for fear of being perceived as an enemy of the free enterprise system. Finally, their desire to maintain impartiality made them leery about entering into any partnership that might make it look as though one or more firms were favored over some others.

This complex set of considerations led to much waffling and indecision. Consider, for example, the juggling of concerns about favoritism, taxpayers' interests, and the wish for the materials to be disseminated ultimately by commercial firms. One way to avoid favoritism, it was argued, would be to make the materials available free of charge to any commercial firm that wanted them–though this would mean giving away what taxpayers had paid for. Also, it soon became obvious that if the materials were simply placed in the public domain, free for the taking, publishers would avoid making use of them for fear that competitors would come out with identical products at marginally lower costs. The result could well become a price war, dashing all hopes of any publishing company making a reasonable profit. The complicated and unstable set of commercial distribution policies that grew out of this tangle of considerations further explain why commercial interest in the projects was limited.[34]

So much, then, for what seem to be at least three major reasons why things did not go as well as planned. Certainly, other forces were at work, too—the Vietnam War, student unrest, and declining school enrollments are among those commonly mentioned in connection with a waning interest in science and mathematics in recent years—but the three I have touched on, although surely not the only cause for the less than hoped-for results of the curriculum reform movement, were contributing factors of no little significance. The only question that remains now is, Where do we go from here?

The first step in determining new directions in curriculum reform is to formulate the problem a little more precisely than has been done so far. We know it has to do with the quality of math and science instruction in our public schools. We know, further, that American students are not doing as well in these subjects as many people believe they can and should do. Beyond that, we know that the new science and math curricula did not succeed in correcting this state of affairs, and in some ways perhaps added to it. But what exactly is the difficulty? Does the fault lie with the teachers or the curriculum, or is there something in the entire school system that needs correction? Might other impediments, having little or nothing to do with the schools, stand in the way? Until we can answer questions like these a little more fully, a remedy for the situation (assuming there can be such a thing) will continue to elude us.

In the interest of answering such questions, while at the same time soliciting suggestions about what to do next, NSF itself sought numerous reactions to the three status studies it sponsored.[35] In addition, under the collaborative undertaking named "Project Synthesis," NSF brought together twenty-three educators and science teachers for the purpose of interpreting not only the NSF-sponsored studies, but also the two NAEP reports on scientific knowledge and attitudes toward science among school-age youth.[36] In addition, there have been at least two federally funded conferences on the subject,[37] plus one sponsored by two private foundations held at Phillips Exeter Academy.[38] Many evaluations and recommendations from individuals have also appeared in professional journals over the past few years,[39] and editorial comment in both the professional and the popular press is too abundant to tally.[40]

Though the different reactions are considerably diverse, almost all agree on the two goals toward which the efforts of all concerned—from private citizens to officials of the federal government—should be directed: ***more*** science and math instruction in our schools, and ***a different kind*** of science instruction at all levels, but especially in the upper grades and beyond.[41]

There is also widespread agreement on what is needed, in general terms, to accomplish these goals: a nationwide campaign, enlisting the help and support of almost everyone, from classroom teachers to congressmen, from the proverbial man-in-the-street to the Nobel laureates of the scientific community.

Neither of the goals will come as a surprise to anyone, nor will the plea for a concerted effort to achieve them. But if we look a little closer at each goal, beginning with the second—for the simple reason that it may well hold the key to the partial attainment of the first—we will see that both are quite complex, no matter how simple and straightforward the rallying cries of "More science!" and "A different kind of science instruction!"

To begin, in what way must science instruction be "different"? In a phrase, it must be "science for all," as opposed to "science for future scientists." Everyone by now seems to agree that a major fault of the NSF-sponsored science curricula was that they were too "preprofessional." They were, that is, not only too difficult for the average student, but were characterized by a singleness of purpose, and that purpose was to ready students for college-level science and beyond.

The desired new science instruction will not be so much "easier"—though that is certainly part of it—as it will be science "brought to life," science taught in a way that will make apparent its relevance to daily living and to current social issues.[42] And it will be "science through thought and action," science taught through laboratory and field experiences that stress the skills of inquiry, problem-solving, and decision-making, as opposed to the mere collection and memorization of scientific terms and facts.

Exactly how much of a change the first suggestion calls for is not entirely clear. Some proponents talk as though all that is needed is for teachers to begin discussing contemporary issues in their classes, using them as examples, setting aside time for class discussions, and so forth. Others insist that the change awaits a major restructuring of our educational priorities and an entirely new set of teaching materials. Examples of societal issues that might appropriately be treated, whether requiring new materials or not, include chemical additives to foods, genetic engineering, pollution, energy conservation, and the disposal of chemical wastes.

The insistence on science teaching that stresses "current issues" and the "personal needs" of students cannot but evoke those heady days in the sixties, when the call for "relevance" in the curriculum was carried to excess in many schools and colleges. Some educators doubtless fear that the same thing could happen again. Yet science that is made more appealing to the average student can also be "good" science. And although the schools have been accused of "sugar-coating" and "watering-down" the curriculum with every move to make learning a more palatable and engrossing experience, such accusations have often turned out to be unwarranted. It will tax the ingenuity of our most talented and dedicated teachers and textbook writers, for some time to come, to make the new science education a solid learning experience.[43]

When we turn to the implementation of the so-called inquiry methods, we encounter a different and perhaps more difficult problem, for these were precisely the methods advocated by the science curricula of the recent past and rejected by teachers for a host of reasons, ranging from broad managerial problems to mundane matters such as the loss of equipment through breakage or theft. Will a renewed call for such "progressive" methods of teaching stand any better chance of being adopted this time around? Probably not, because the difficulties remain. What this says about the goal of getting students to "think scientifically" or to apply "the scientific method" to their own lives is a question to which I shall return.

The first of the two goals, that of having more high-school students enrolled in science classes, is at least partially dependent on how successful teachers are with the second, "bringing science to life." The logic linking these goals is incontrovertible, for if science is made more attractive, more high-school students will elect to study it. Yet this expectation is not sufficient to allay the concerns of some critics, who insist that the schools and our nation as a whole cannot afford to bank on more science being called for by popular demand. In addition to improved courses, they say, we need *requirements* mandating an increased amount of time for science in the lower grades[44] and an increase in the number of required science courses in high school.[45] But to do this will mean that the increased time or course credits must necessarily displace something else in the school day, because the amount of time spent in school is fixed and has not changed greatly over the past several decades. Thus the bid for more science instruction is almost certain to set off an internecine struggle for curricular "turf," particularly above the elementary grades, where most teachers are subject matter specialists. Unless those who argue for more science also insist upon a longer school day or a longer school year, their objective, if it is attained, will mean less of something else, even if nothing more than a shortened lunch hour or a forgone study period.[46]

There is also the question of who will teach these courses, since many parts of the country are already suffering a shortage of science and math teachers. Over the long haul, market forces will undoubtedly produce the needed supply of teachers, as they have done in the past, but in the face of the current critical teacher shortage in the sciences, it is not clear how we will begin to move toward this goal.

On the methods of achieving the two goals, there is nearly unanimous agreement on the necessity of a broad campaign carried forward on many fronts, with something for everyone to do. Among the suggestions that have been made so far, are the following.

- Classroom teachers should begin immediately to enliven their instruction by emphasizing the connection between science and everyday affairs.
- Textbook writers must follow suit by developing new institutional materials reflecting the same change in emphasis.
- Professional organizations must help broadcast the alarm, bringing the problem to the attention of the public, while enlisting the support of their own membership in seeking a solution.
- Teacher educators are urged to strengthen the science component in training programs for teachers.
- Private foundations need to help identify exemplary science programs and outstanding science teachers so that others might learn how to improve their own practice.
- School systems must create new supervisory positions, placing within each system, if not within every school, a "science resource specialist" to help advise teachers on how to improve their science instruction.
- The federal government must develop a "sensing system," more extensive and elaborate than the current NAEP, with the explicit function of keeping the nation informed about the state of science instruction.

- Summer institutes should be established once again, to keep classroom teachers up-to-date in their understanding of science and to introduce them to new curricular materials.
- Federally supported centers at which the most current programs and instructional strategies could be observed might well be another means for keeping teachers up-to-date.
- Conferences, sponsored by a wide variety of funding agencies, are needed to bring together science teachers, practicing scientists, government officials, and others for the purpose of combining many different perspectives in search of a solution to the problem.
- Directors of museums and managers of public radio and television are urged to bring the problem to the attention of a wider public and to help supplement the instructional capabilities of the schools.
- Private industry must do its part by offering summer jobs to science and math teachers to augment their income, thus enabling them to remain as classroom teachers rather than taking higher-paying jobs elsewhere.

The point of this list, which is by no means complete, is to show that not only is the call to action quite broad in scope, but that much of what needs to be done is sensible, down-to-earth, and can be acted on with little fuss and bother. Some of the points, of course, will not be quite so simple to effect.

What the list fails to give, as do also the supporting arguments accompanying the recommendations, is the true scope of the problem, fails to show that it extends far beyond the teaching of science and mathematics. Yet the absence of that vision is not quite total, for in its review of the NSF-sponsored studies, a panel representing the American Association for the Advancement of Science concluded that "the time is ripe for an in-depth examination of the goals and purposes of precollegiate education" and spoke of the need for "a *reaffirmation of concern for quality* in education."[47] And a panel representing the National Academy of Science and the National Research Council acknowledged that the evidence from the three studies commissioned by NSF points to "a troubled American school system."[48] But by and large, those who seem to be most up in arms about what should be done next rarely worry about the state of the total system. Their concern seems fixated on the math and science portions of the curriculum and what can be done to improve them.

Given the backgrounds and vested interests of those who are most upset about the current state of math and science instruction, their concentration on a piece of the curriculum rather than the whole of it is understandable—but lamentable all the same. By neglecting to consider how widespread the problem of inadequate instruction and a weak curriculum might be, the advocates of more and better science and math run the risk of cutting themselves off from the much needed support of what could become a veritable army of allies—thousands of teachers, school administrators, university professors, concerned citizens, and others—who have almost precisely the same concerns with respect to *other* subjects and *other* portions of the curriculum, and with the way the schools are run in general.

Dull courses; instruction that bears no relation to the concerns and interests of students; emphasis on the memorization of facts and the consequent neglect of critical thought; half-hearted teachers; petty administrative practices—the history of educational criticism in this century, and long before, reminds us that these defects are by no means restricted to math and science alone, but are endemic throughout the system and have been for generations.

But here, a cautionary note. This litany of complaints is not a blanket indictment of our schools, nor does criticism of math and science instruction imply that all is lost there either. A lot of good things are happening in America's classrooms, in every subject and at every grade level. No one who has visited extensively in our schools in recent years, as I have, can fail to acknowledge that for every defect there are corresponding strengths: exciting courses; instruction tied to the concerns and interests of students; emphasis on critical thought and the consequent deemphasis of memorization for its own sake; enthusiastic teaching; bold and imaginative administrative practices. These are there as well, and have been for generations, as the history of educational innovation and the testimony of former students so eloquently bear witness.

The broader question becomes one of how to rid the system of what common sense alone tells us should go, while preserving and strengthening what the best teachers and the best administrators have been practicing for some time. Easier said than done, no doubt, and not something that any single group, bent on reform, can accomplish alone. All who care deeply about the sorry state of science and math instruction in our schools should be encouraged to join forces with those who care as deeply about other subjects and how well they are being taught. These two groups, in turn, must fall in step with enlightened administrators and others who are responsible for the well-being of the total enterprise. What is needed is a sense of partnership, an awareness of common cause uniting *everyone* who seeks to see our schools become better than they are.

Some division of labor is certainly inevitable and highly desirable as well, for to be effective, all large work forces require some degree of specialization. At the same time, we must be careful to avoid having these divisions become divisive as well, by pitting science or math teachers and their supporters, for example, against those who teach other subjects. One and all must realize that *good* science teachers have more in common with, say, *good* English teachers, and vice versa, than either does with mediocre or poor teachers within their own specialties. Similarly, conscientious administrators have more in common with like-minded teachers than either does with administrators or teachers who are derelict or lackadaisical in the performance of their duties. In sum, the primary loyalty of everyone connected with our schools needs be to the *quality* of the educational service being provided, rather than to this or that portion of the curriculum, or to this or that institutional role.

Finally, there remains the question of whether the "inquiry," or "discovery," approach to the teaching of science might fare any better in the future than it has in the recent past. Moreover, if—as I tend to believe—it does not, what does that say about the school's ability to foster "scientific thinking" and "a scientific attitude" among students?

Science taught by textbooks, even when supplemented by films and classroom demonstrations, does leave much to be desired. It is of doubtful value compared to science teaching that makes use of laboratory work, field studies, and other forms of "hands-on" experience. James B. Conant observed that

> the stumbling way in which even the ablest of scientists in every generation have had to fight through thickets of erroneous observations, misleading generalizations, inadequate formulations, and unconscious prejudice is rarely appreciated by those who obtain their scientific knowledge from textbooks.[49]

The experience of "doing" science, experiencing its frustrations as well as its excitements, is one of the most important things sacrificed in the textbook-plus-recitation method of teaching.

At the same time, as essential as laboratory work, field trips, and all the rest of it might be to the teaching of science, it would be a mistake to believe—as some advocates of science instruction seem close to at times—that science is the sole vehicle within the school for conveying the skill and the habit of clear thought and rigorous argumentation. The conjoining of the ideas of scientific method and intellectual rigor became prevalent during the Enlightenment, and to this day, many continue to describe as "scientific" almost any mental posture that stands staunchly opposed to superstition, dogma, sentimentality, unbridled enthusiasm, and just plain muddled thinking. Among educational theorists, John Dewey was probably the most prominent advocate of the view that "scientific method," as he called it, and the principles of "inquiry"—his favorite term for reflective thought—were really one and the same.[50]

But Dewey's insistence on labeling as "scientific" such things as open-mindedness, intellectual honesty, impartiality, objectivity, and so forth, though perhaps in step with the thinking of his time, is quite off the mark with respect to the way such characteristics are increasingly thought of today. So, too, are all who persist in pinning their hopes for the development of those very same attitudes and intellectual qualities on what students pick up during that small fraction of their school experience devoted to instruction in science and mathematics. This is not to say that open-mindedness, objectivity, and all the rest of it are not among the hallmarks of scientific thought the world over. Of course they are. Nor is it to suggest that instruction in science and math can make no important contribution to the development of those qualities among the young. Of course it can.

It is to insist, however, that scientists and mathematicians have no corner on the techniques of sound reasoning and clear thought, nor do science and mathematics teachers stand alone as purveyors of the kind of tough-mindedness that has become historically linked to the emergence of a scientific world view.[51] Teachers of many other subjects are there to help as well. All share the common goal of seeking to extend the powers of critical rationality in the students under their care. The whole world has a stake in how well that job is accomplished.

ENDNOTES

[1] Marjorie H. Gardner, "A Brief History of Federal Involvement in Curriculum Development, mimeographed, March 1977. U.S. House Committee on Science and Technology. Committee Print, "The National Science Foundation and Pre-Col-

lege Science Education: 1950-1975," by Landon T. Crane. 94th Congress, second session, 1976.

[2] Vannevar Bush, *Science—The Endless Frontier*, National Science Foundation, Washington, D.C., 1945.

[3] Gardner, "A Brief History of Federal Involvement."

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[5] Iris R. Weiss, Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education, stock no. 038-000-00364. (Washington, D.C.: U.S. Government Printing Office, 1977).

[6] Robert E. Stake, Jack Easley, et al., *Case Studies in Science Education*, vol. 1, *The Case Reports*, stock no. 038-000-00377-1 (Washington, D.C.: U.S. Government Printing Office, 1978); Robert E. Stake, Jack Easley, et al., *Case Studies in Science Education*, vol. 2, *Design, Overview and General Findings*, stock no. 038-000-00376-3 (Washington, D.C.: U.S. Government Printing Office, 1978).

[7] Stanley L. Helgeson, Patricia E. Blosser, and Robert W. Howe, *The Status of Pre-College Science, Mathematics, and Social Science Education: 1955-1975*, vol. 1, *Science Education*, stock no. 038-00-00362-3 (Washington, D.C.: U.S. Government Printing Office, 1977).

[8] National Assessment of Educational Progress, *A Summary of Results from the 1976-1977 National Assessment of Science* (Denver, Colorado: Education Commission of the States, 1978); also, *Attitudes toward Science, A Summary of Results of the 1976-1977 National Assessment of Science* (Denver, Colorado: Education Commission of the States, 1979).

[9] See, for example, James A. Shymansky and William C. Kyle, "The Era of Inquiry Learning: How Effective Were the Science Curricula of the Sixties?" Xeroxed ms. 21 pp. n.d. A summary of this report appears in William C. Kyle, Jr., James A. Shymansky, and Jennifer M. Alport, "Alphabet Soup Science: A Second Look at the NSF-Funded Science Curricula," *The Science Teacher*, November 1982, pp. 49-53.

[10] See, for example, Paul DeHart Hurd, "An Exploratory Study of the BSCS Secondary School Curriculum materials," *The American Biology Teacher* 38(2) (February 1976): 79-85.

[11] Stanley L. Helgeson, Robert E. Stake, Iris R. Weiss, et al., *The Status of Pre-College Science, Mathematics, and Social Studies Educational Practices in U.S. Schools: An Overview and Summaries of Three Studies*, stock no. 038-000-00383. (Washington, D.C.: U.S. Government Printing Office, 1978).

[12] Suzanne Kay Quick, "Secondary Impacts of the Curriculum Reform Movement: A Longitudinal Study of the Incorporation of Innovations of the Curriculum Reform Movement into Commercially Developed Curriculum Programs," Ph.D. thesis, Stanford University, 1977.

[13] Kyle et al., "Alphabet Soup Science," p. 52.

[14] Saville Davis and Jerrold Zacharias, *We Need Good Schools—How to Go about It* (Newton, Mass.: Educational Development Center, 1979), p. iv-1.

[15] Helgeson, Blosser, and Howe, *The Status of Pre-College Science*, vol. 1, p. 28.

[16] Helgeson, Stake, Weiss, *et al. The Status of Pre-College Science*.

[17] James W. Wilson, personal communication, April 10, 1979.

[18] Helgeson, Stake, Weiss, et al., *The Status of Pre-College Science*.

[19] Helgeson, Blosser, and Howe, *The Status of Pre-College Science*.

[20] Helgeson, Stake, Weiss, *et. al.*, *The Status of Pre-College Science*, p. 12.

[21] Ibid., p. 8.

[22] Stake, Easley, *et al. Case Studies in Science Education*, vols. 1 and 2.

[23] Paul Dehart Hurd, personal interview, February 2, 1979.

[24] "The National Science Foundation and Pre-College Science Education."

[25] Paul DeHart Hurd, personal interview, February 2, 1979.

[26] Davis and Zacharias, *We Need Good Schools*, pp. 1-27.

[27] There is an additional explanation that is sometimes offered for the failure of governmental undertakings in our country: designers of large-scale projects requiring huge amounts of money are practically forced to oversell their proposals if they are to win the backing of Congress and receive the necessary funding. Among other things, this means promising more in the way of success than the proposers themselves believe can be delivered. This leads us to suspect that the curriculum designers knew all along that their products would never win national acceptance, but they had to pretend otherwise in order to obtain the necessary funds. The trouble with such a *post hoc* explanation is that there is no way of checking its validity. It is further weakened by the fact that the expressions of disappointment come from the reformers themselves and not just from those who were allegedly "oversold" on the prospect of the reform's success. It is possible, of course, to accuse the reformers of not being genuine in their expressions of disappointment, but their integrity as outstanding scientists and science educators makes that accusation absurd.

[28] Helgeson, Blosser, and Howe. *The Status of Pre-College Science*, vol. 1.

[29] Stanley L. Helgeson, "Impact of the National Science Foundation Teacher Institute Program," Ohio State University, December 1974, mimeographed.

[30] Wayne W. Welch. "Twenty Years of Science Curriculum Development: A Look Back," *Review of Research in Education* (1979): 282-306.

[31] Crane, "The National Science Foundation and Pre-College Science Education."

[32] Ibid., p. 181.

[33] Gardner, "A Brief History of Federal Involvement," p. 29.

[34] Crane, "The National Science Foundation and Pre-College Science Education," p. 82.

[35] The replies to those studies from panels of experts representing several professional organizations appear in *What Are the Needs of Precollege Science, Mathematics and Social Science Education? Views from the Field*, National Science Foundation, SE 80-9, Washington, D.C., n.d.

[36] *What Research Says to the Science Teacher*, vol. 3, edited by Norris C. Harms and Robert E. Yager, Washington, D.C., National Science Teachers Association, 1981, NSTA stock no. 471-14776.

[37] Several papers from the first of these two conferences appear in *Value Conflict and Curriculum Issues*, edited by John Schaffarzick and Gary Sykes (Berkeley, California: McCutchan, 1979). The other, held in May 1982, is reported on in *Science and Mathematics in the Schools* (Washington, D.C.: National Academy Press, n.d.), LC no. 82-61746.

[38] The conference was named the "Exeter Conference on Secondary School Science." A booklet reporting on its outcome was published by the Trustees of Phillips Exeter Academy in 1980.

[39] A representative sampling of such recommendations takes up a large portion of a recent issue of *Educational Evaluation and Policy Analysis* 3 (5) (September-October 1981).

[40] See, for example, Frank Press, "The Fate of School Science," *Science* 261 (4) (June 1982): 1055. Also, John Walsh, "Science Education—Deja Vu Revised," *Science* 216 (28) (May 1982): 963.

[41] Whether a similar change is necessary in math instruction is not clear.

[42] "Scientific literacy" is the term most commonly used to describe the goal of such a curricular change. See, for example, Edward B. Fiske, "Wiping Out Scientific 'Illiteracy,' " *New York Times*, Tuesday, December 14, 1982, p. 17.

[43] For an interesting report on one scientist's attempt to meet that challenge, see Jeremy Bernstein, "Science Education for the Non-Scientist," *The American Scholar*, Winter 1982/83, pp. 7-12.

[44] In its position paper on the subject, the National Science Teachers Association recommends a minimum of one-and-a-half hours per week of science for the lower grades (K-3), two-and-a-half hours per week for grades four to six, and one hour a day for at least two academic years in grades seven through nine. See "Science-Technology-Society: Science Education for the 1980s," Washington, D.C., National Science Teachers Association, 1982, p. 3.

[45] The NSTA calls for a minimum of two years of science for all high-school students. Ibid.

[46] One way around this difficulty might be to combine instruction in science with instruction in other subjects, through the creation of curricular offerings that cut across subject matter boundaries. This is by no means a new idea, as anyone with a smattering of educational history in his background will quickly attest. The goal of an "integrated" or "correlated" or "unified" curriculum was among the rallying cries of the progressive education movement during the early part of this century. Moreover, that goal was more than a mere slogan. Its espousal has led to the development of some noteworthy interdisciplinary course offerings over the years, particularly in high schools and colleges. Today's "social studies" and "language arts"—the former combining what used to be history and geography, the latter covering what used to be handwriting, composition, spelling, and grammar—remain an enduring curricular innovation (though not universally admired!) of the Progressive Era.

Yet for reasons having to do in part with the way knowledge is organized at the highest reaches of education, and in part with how much an individual teacher (or even a team of teachers) can be expected to master, today's interdisciplinary curricular offerings remain the exception rather than the rule. Could that situation change in the future? Possibly so, but those who want more science taught in our schools would be foolhardy to pin their hopes on such an eventuality.

[47] National Science Foundation, *What Are the Needs in Precollegiate Science*, pp. 55, 74.

[48] Ibid. p. 79.

[49] James B. Conant, *Science and Common Sense* (New Haven: Yale University Press, 1951).

[50] See, for example, Dewey's *How We Think* (Lexington, Mass.: D.C. Heath and Company, 1932). A related but weaker view is voiced in Karl Pearson's observation that "modern science, as training the mind to an exact and impartial analysis of facts, is an education specially fitted to promote sound citizenship," *The Grammar of Science* (London: W. Scott, 1892).

[51] For a forceful defense of the continuity between the sciences and the humanities, particularly with respect to the kinds of reasoning and argumentation each employs, see Stephen Toulmin, "The Construal of Reality: Criticism in Modern and Postmodern Science," *Critical Inquiry* 9 (1) (September 1982): 93-111.

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V. TEACHERS, SCHOOL ADMINISTRATION, AND SCHOOL FINANCE

R-3177-RC

Beyond the Commission Reports

The Coming Crisis in Teaching

Linda Darling-Hammond

Linda Darling-Hammond is Director of Rand's Education and Human Resources Program.

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PREFACE

The text of this report was first compiled and presented as a briefing to The Rand Corporation Board of Trustees on April 13, 1984. The research on which it is based was accumulated over the course of several Rand studies of the teaching profession, supported in part by the National Institute of Education and The Ford Foundation. Because of widespread interest in the topic, the briefing is being published as a report so that it can be made available to education policymakers, practitioners, and researchers who are concerned about the status of, and the prospects for, the teaching profession.

SUMMARY

This report treats the current status of the teaching profession at a time when renewed efforts to improve the quality of American education are occurring at the federal, state, and local levels. The report demonstrates that dramatic changes in our nation's teaching force will soon lead to serious shortages of qualified teachers unless policies that restructure the teaching profession are pursued. Until teaching becomes a more attractive career alternative, the problems of attracting and retaining talented teachers will undermine the success of other reforms intended to upgrade educational programs and curricula.

The report analyzes recent data indicating changes in the recruitment and retention patterns of the American teaching force, in the quality of teachers, and in the attractiveness of teaching as a profession. The current highly educated and experienced teaching force is dwindling as older teachers retire in increasing numbers and many younger teachers leave for other occupations. Recent evidence suggests that new recruits to teaching are less academically qualified than those who are leaving, and the number of new entrants is insufficient to meet the coming demand for teachers. The most academically able recruits to teaching leave the profession within a very short time. Shortages of qualified teachers in subject areas such as mathematics and science are expected to grow over the next few years into a more generalized teacher shortage as enrollments increase and the supply of prospective teachers continues to shrink.

Several factors contribute to this problem. Demographic trends are provoking supply and demand imbalances for teachers. More significantly, though, academically talented women and minorities, who were once restricted to teaching as a professional option, are now choosing other occupations that promise greater financial rewards, more opportunities for advancement, and better working conditions. Teachers' salaries fall well below those of most other occupations that require a college degree, and average teachers' salaries have been declining for the past decade. The non-pecuniary rewards of teaching have also been dwindling, as teachers are increasingly viewed as bureaucratic functionaries rather than as practicing professionals. Lack of input into professional decisionmaking, overly restrictive bureaucratic controls, and inadequate administrative supports for teaching contribute to teacher dissatisfaction and attrition, particularly among the most highly qualified members of the teaching force.

Unless major changes are made in the structure of the teaching profession, so that teaching becomes an attractive career alternative for talented individuals, we will in a very few years face widespread shortages of qualified teachers. We will be forced to hire the least academically able students to fill these vacancies, and they will become the tenured teaching force for the next two generations of American school children.

Higher salaries for teachers are only part of the solution to this problem. As in other occupations, working conditions that affect teachers' abilities to perform their jobs effectively are a partial substitute for wages. In teaching, a particularly important aspect of those working conditions is the degree of professionalism allowed in the work structure. Professionalizing teaching will require a new career structure in which improved preparation and professionally enforced standards of practice are combined with increased responsibility for technical decisionmaking by those who successfully demonstrate their competence. Upgrading teacher compensation and creating more professional working conditions are part of a structural solution, one that addresses the interrelated causes of the teacher supply and quality problems, rather than merely their symptoms.

ACKNOWLEDGMENTS

This report is the product of many people's insights. Several years of research and reflection on teaching issues by Arthur E. Wise provided much of the conceptual background for this study. Rand researchers Thomas K. Glennan, Paul T. Hill, Sue E. Berryman, and Richard Shavelson contributed important criticisms as the briefing was being prepared. David Lyon provided motivation for compiling the briefing and this report. Mary Vaiana assisted in the cogent formulation of the ideas presented herein. The author, of course, remains responsible for any errors of fact or interpretation that have survived their careful scrutiny.

BEYOND THE COMMISSION REPORTS: THE COMING CRISIS IN TEACHING

WANTED

College graduate with academic major (master's degree preferred). Excellent communication and leadership skills required. Challenging opportunity to serve 150 clients daily, developing up to five different products each day to meet their needs. This diversified job also allows employee to exercise typing, clerical, law enforcement, and social work skills between assignments and after hours. Adaptability helpful, since suppliers cannot always deliver goods and support services on time. Typical work week 47 hours. Special nature of work precludes fringe benefits such as lunch and coffee breaks, but work has many intrinsic rewards. Starting salary $12,769, with a guarantee of $24,000 after only 14 years.

The conditions described in this want ad accurately characterize the typical secondary school teaching assignment in the United States today. Who would take a job like this? The answer to that question is the topic of this report.

The Emerging Crisis in Teaching

Over the past eighteen months, a number of major reports have been issued on the quality of American education. Reports from the National Commission on Excellence in Education, the Education Commission of the States, the National Science Board, the Twentieth Century Fund, and other institutions have called for higher educational standards, increased course requirements, and other major reforms designed to improve the quality of instruction. The message of these reports is important. However, the crisis now emerging in the teaching profession could preclude the attainment of the other reforms being urged. If public schools are to attract enough highly qualified people to become teachers, working conditions and compensation must change in significant ways.

The nation's teaching force is changing dramatically. The current highly educated and experienced staff is dwindling as older teachers retire and many younger teachers leave for other occupations. Recent evidence suggests that new recruits to teaching are less academically qualified than those who are leaving; moreover, the number of new entrants is insufficient to meet the coming demand.

Chart 1 shows the decline in academic ability of students planning to become teachers, as measured by scores from Scholastic Aptitude Tests (SAT). The scores of students planning to major in education have traditionally been lower than those of other students. In addition, over the past decade, the scores of potential education majors have declined more steeply than those of other students.[1] Most teaching recruits are now drawn from the bottom group of SAT scorers; most of the few top scorers who are recruited to education leave the profession quickly.[2]

Chart 2 shows the pattern of attrition from teaching, using data for white female entrants to the teaching profession in 1973 in North Carolina. Here the measure of ability is the National Teachers Examination (NTE), which is given to prospective teachers in many states. The attrition rates of the North Carolina teachers tested in 1973 were

Academic Ability of Incoming Teachers Is Declining

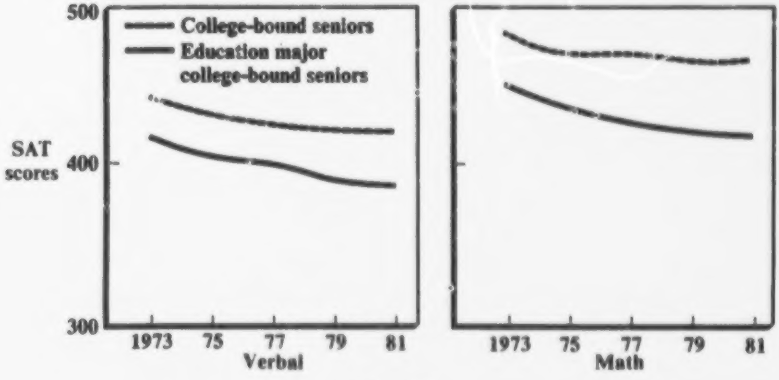

Chart 1

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[1] National Center for Education Statistics, *The Condition of Education, 1982 Edition*, U.S. Department of Education, 1982, p.111.

[2] For example, 28 percent of the lowest quintile of SAT scorers from the high-school class of 1973 went into teaching, and more than half of them planned to stay in the profession. By contrast, only 8 percent of the highest quintile went into teaching, and only 25 percent of them planned to stay. Victor S. Vance and Phillip C. Schlechty, *The Structure of the Teaching Occupation and the Characteristics of Teachers: A Sociological Interpretation*, Paper presented at the National Institute of Education Conference at Airleigh House, Virginia, February 25–27, 1982.

Attrition Rates of Teachers

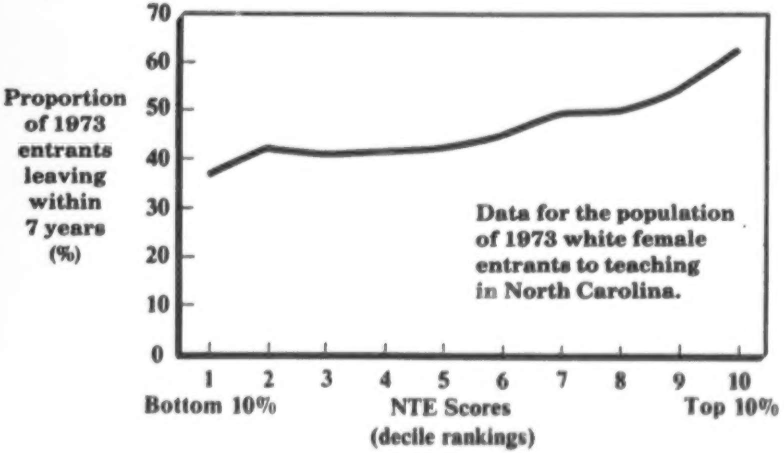

Chart 2

directly related to NTE scores: Many more top scorers than bottom scorers left teaching within 7 years. By 1980, almost two-thirds of the top decile had left, whereas only about one-third of the bottom decile had left.[3]

Although these measures of academic ability do not fully predict teaching performance, it is clear that the teaching profession is attracting and retaining fewer academically able young people than it has in the past.

For most of the past decade, there has been a widely recognized surplus of teachers, so policymakers have not been aware of recent changes in recruitment patterns. In the past few years, though, shortages have been occurring in certain teaching areas, particularly in secondary school specialties. A recent survey of teacher placement officers[4] identified nationwide shortages in the following areas:

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[3] Phillip C. Schlechty and Victor S. Vance, "Do Academically Able Teachers Leave Education? The North Carolina Case," *Phi Delta Kappan*, Vol. 63, 1981, pp. 106–112.

[4] Association for School, College and University Staffing, *Teacher Supply/Demand, 1984*, Madison, Wisconsin, 1984.

- Mathematics
- Physics
- Computer programming
- Chemistry
- Data processing
- Bilingual education
- Special education
- Earth science
- Biology
- English

The shortages in mathematics and the sciences are particularly severe, but other teaching areas that formerly showed surpluses are also joining the list. The shortages have immediate effects on educational quality, because they mean that courses must often be taught by teachers who are not qualified in the subject areas.

Charts 3 and 4 show the dimensions of this qualifications problem. In 1981, the most recent year for which data are available, fewer than half of the newly hired teachers in mathematics and science were certified or eligible for certification in the subjects they were assigned to teach. Fewer than two-thirds of the newly hired teachers in English, social studies, and other secondary subjects were qualified by this criterion.[5]

The shortage of mathematics and science teachers exemplifies the magnitude of the long-range teacher supply problem. According to one set of estimates, of a total teaching force of about 200,000 mathematics and science teachers, 9 percent left in 1982–83, 30 percent are not fully qualified for the subjects they are teaching, and over 40 percent will retire within the next decade.[6] The National Science Teachers Association estimates that 300,000 new mathematics and science teachers will be needed by 1995—more than the total number of mathematics and science teachers currently teaching.[7]

Furthermore, there is no indication that the teaching profession is attracting new mathematics and science teachers at a rate that might potentially meet the increased demand. In fact, as Chart 5 shows, exactly the opposite is true. In 1981, the nation's colleges granted fewer than 1400 bachelor's degrees in the fields of mathematics and

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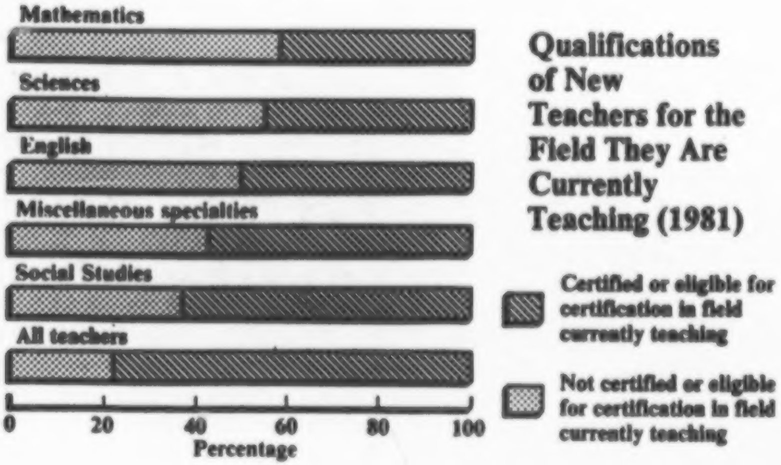
[5] National Center for Education Statistics, *The Condition of Education, 1983 Edition*, U.S. Department of Education, 1983, p.206.

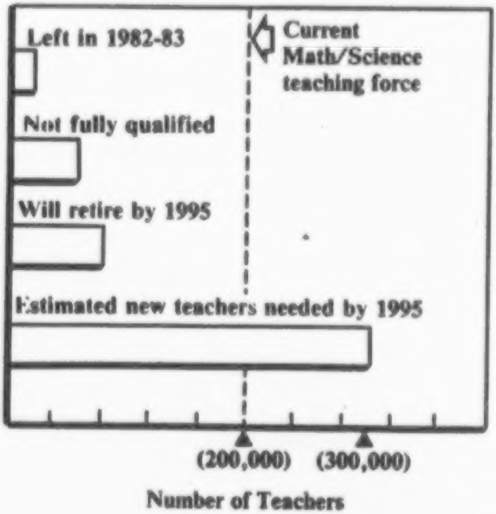
[6] National Science Teachers Association Survey, December 1982, reported in Hope Aldrich, "Teacher Shortage: Likely to Get Worse Before It Gets Better," *Education Week*, July 27, 1983.

[7] Ibid.



Qualifications of New Teachers for the Field They Are Currently Teaching (1981)

Chart 3



Status of the Mathematics and Science Teaching Force

Chart 4

science education combined.[8] This number represents less than one mathematics or science teacher for every ten school districts in the United States. In the following school year, 1982–83, about 18,000 mathematics and science teachers left their teaching positions. (About 37 percent of these teachers left for non-teaching employment; 9 percent retired; and the remainder took other teaching-related jobs.)[9]

All indications are that the shortages of specialized teachers will expand to a more general shortage of qualified teachers within the next few years. Given current trends in school-age population, entrants to the teaching profession, and attrition, the supply of new teacher graduates may satisfy only about 80 percent of the demand for additional teachers by 1988[10] (see Chart 6).

Although teacher shortages have occurred before, most recently in the 1960s, there are new reasons for the current shortages, and new responses will be required. Demographic trends, expanded

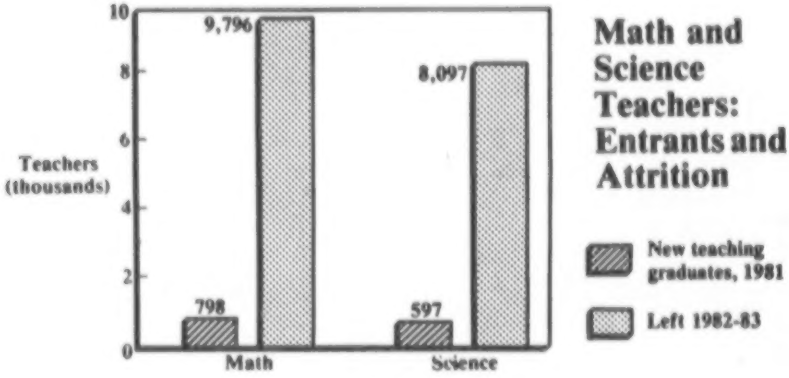


Chart 5

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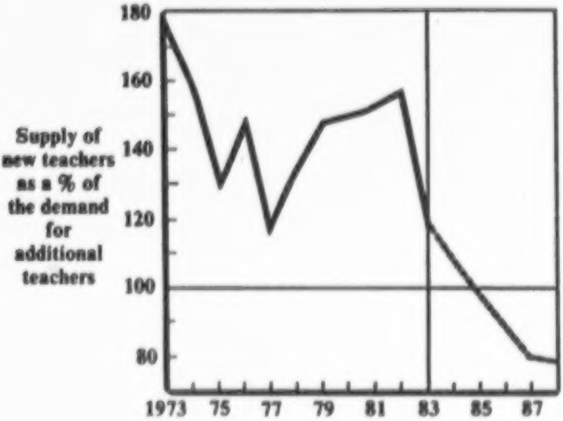
[8] NCES, *The Condition of Education, 1983*, p. 188.

[9] N.S.T.A. Survey, op. cit.

[10] Estimates derived from Table 2.9, National Education Association, *Teacher Supply and Demand in Public Schools*, 1973, 1976, 1977, 1978; and National Center for Education Statistics, *Projections of Education Statistics to 1988–89*, U.S. Department of Education, 1980. More recent projections by NCES place low to intermediate supply estimates for 1990 at 55 to 110 percent of demand; NEA projections estimate that the supply of new graduates will fill 70 percent of the demand in 1990. NCES, *Projections of Education Statistics to 1990–91*, 1982, p.86; NEA, *Teacher Supply and Demand in Public Schools, 1981–82*, 1983, p.22.



A General Shortage of Teachers Is Imminent

Chart 6

opportunities for minorities and women, and the low salaries and lack of prestige associated with teaching—each a powerful force in itself—combine to make solutions to the shortage problem more difficult to design and implement.

Demographic trends have provoked supply and demand imbalances in teaching before, and they are doing so once again. As Chart 7 shows, the sources of supply and demand are moving in opposite directions for the short-term future. After a decade of declining enrollments in elementary and secondary schools, a baby boomlet that began in the early 1980s will begin to cause enrollment increases starting in 1985. At the same time, the college-age population from which most potential teachers will be drawn will continue to decline through the remainder of the decade and slightly beyond.

Meanwhile, the number and proportion of bachelor's degrees conferred in education have declined fairly steeply over the past decade. In times past, public education was a major employer of college graduates. In 1971, for example, more than 20 percent of the bachelor's degrees conferred were in education. By 1981, the proportion had dipped to less than 12 percent.[11] This decline may have been partly a response to the teacher surpluses that characterized the 1970s;

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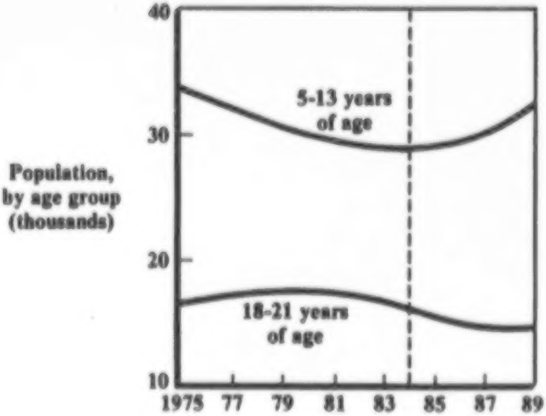
[11] NCES, *The Condition of Education, 1983*, p. 184.



School-Age Population Trends

Chart 7

however, the data suggest that other market forces are at work as well. Alternative occupations are available to a wider spectrum of college graduates, and many are choosing these more lucrative fields, even though the demand for teachers is growing. There is no sign that supply is responding to demand even in fields where there are widely publicized shortages. The number of education degrees conferred in mathematics and science, for example, continues to decline.[12]

One of the labor market factors having the greatest effect on the teaching profession is the growth in opportunities available to women and minorities. Women have traditionally comprised the large majority of the teaching force, and they still do so. However, academically talented women, in particular, are increasingly pursuing other occupations. Between 1970 and 1980, the proportion of women receiving bachelor's degrees in education decreased by half, from 36 percent to 18 percent. By 1981, the proportion had dropped to 17 percent.[13] During that decade, women's professional options expanded enormously, as Chart 8 shows. Women's occupational choices shifted from education, English, and the social sciences to business and commerce and the health professions. The proportion of degrees granted to women also

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[12] Ibid., p. 188.

[13] Ibid., p. 184.

Bachelor's and First Professional Degrees for Women — 1970-1980

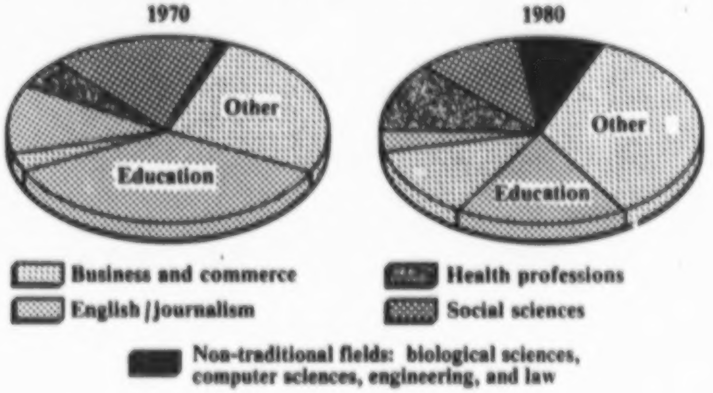

Chart 8

increased tenfold in the biological sciences, computer sciences, engineering, and law.[14]

Why Has Teaching Lost its Appeal?

Can academically able students be reattracted to the teaching profession in a labor market that offers other, more attractive choices?

The current salary structure of the teaching profession will surely not provide strong motivation. Beginning salaries for teachers are lower than those in virtually any other field requiring a bachelor's degree (Chart 9). Even when teaching salaries are adjusted to reflect a twelve-month salary equivalent, they fall short of the next lowest category (liberal arts graduates).[15] Teachers' salaries also reach a ceiling much sooner and at a much lower level than do the salaries of other college-educated workers.

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[14] Bureau of the Census, *Statistical Abstract of the United States: 1984*, 104th ed., U.S. Department of Commerce, 1983, p.166; Bureau of the Census, *Statistical Abstract of the United States: 1973*, 94th ed., U.S. Department of Commerce, 1973, p. 133.

[15] Data are for the 1981–82 school year. National Education Association, *Prices, Budgets, Salaries, and Income: 1983*, 1983, p. 22.

Beginning Salaries of Bachelor's Degree Graduates

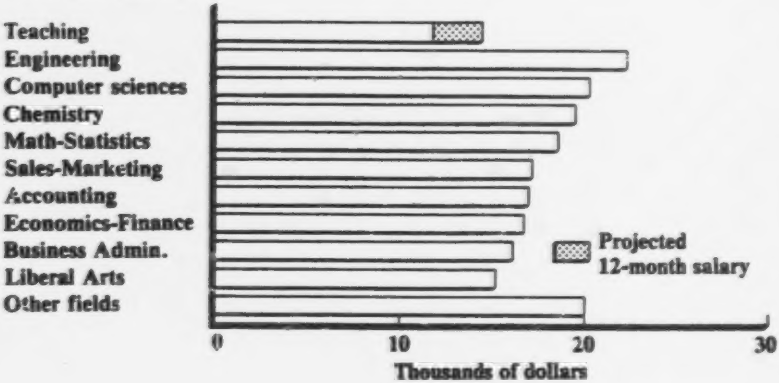

Chart 9

The situation is made worse by the fact that teachers' salaries have lost ground relative to other occupational salaries over the past ten years. Although there is a common perception that teachers' salaries have improved as a result of collective bargaining, average salaries for teachers actually declined by nearly 15 percent in real dollar terms between 1971 and 1981,[16] even though the average experience level of the teaching force increased over that period, as did the average education level. The majority of teachers now have at least a master's degree and about 13 years of experience.[17]

The data paint a rather gloomy picture of the recruitment potential of the teaching profession. But many studies suggest that people are attracted to teaching for altruistic reasons—because they love to work with children and want to make a contribution to society. Indeed, the primary rewards of teaching are the intrinsic, non-pecuniary satisfactions derived from imparting knowledge and seeing young people grow and learn.[18] But even these satisfactions have been declining as the nature of teaching work has changed. Teachers express increasing dissatisfaction with the conditions under which they work and the policies that define their classroom activities.

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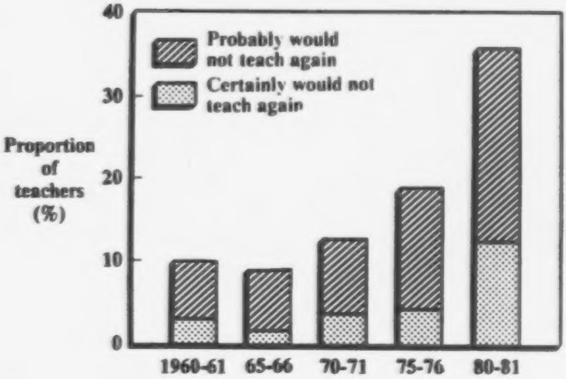
[16] NCES, *The Condition of Education: 1983*, pp. 102–103.

[17] National Education Association, *Nationwide Teacher Opinion Poll, 1983*, 1983. p. 6.

For several decades, the National Education Association has polled several thousand teachers annually about their teaching conditions and views. One question asked in each poll is, If you could go back and start all over again, would you still become a teacher? Chart 10 shows the dramatic change in the response to that question over twenty years. Between 1971 and 1981, the proportion of respondents saying they would not teach again more than tripled, rising from about 10 percent to nearly 40 percent. Less than half of the present teaching force say they plan to continue teaching until retirement.[19]

It is easy to summarize the factors that contribute to teacher dissatisfaction. Teachers feel that they lack support—physical support in terms of adequate facilities and materials; support services such as clerical help for typing, duplicating, and paperwork chores; and



Percent of Teachers Who Would Not Teach Again — Teacher Dissatisfaction Has Increased...

Chart 10

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[18] See, for example, Daniel C. Lortie, *Schoolteacher: A Sociological Study*, Chicago: University of Chicago Press, 1975; Phillip W. Jackson, *Life in Classrooms*, New York: Holt, Rinehart and Winston, 1968; Linda Darling-Hammond and Arthur E. Wise, *A Conceptual Framework for Examining Teachers' Views of Teaching and Educational Policies*, The Rand Corporation, N-1668-FF, February 1981.

[19] National Education Association, *Status of the American Public School Teacher, 1980–81*, 1982, pp. 73–76.

administrative support that would provide a school environment in which their work is valued and supported rather than obstructed by interruptions and a proliferation of non-teaching tasks. They see their ability to teach hampered by large class sizes and non-teaching duties. And they feel that they are not treated as professionals. They have limited input to decisions that critically affect their work environment, and they see few opportunities for professional growth.[20]

Let us translate these categories into more concrete terms. Imagine that you are a high-school English teacher. You have at least a master's degree (as do most teachers today) and you would like to impart to your students the joys of great literature and the skills of effective communication. You have at your disposal a set of 100 textbooks for your 140 students. You cannot order additional books so you make copies of some plays and short stories, at your own expense, and you jockey with the 50 other teachers in your school for access to one of the two available typewriters so that you can produce other materials for your class. You stand in line after school to use the secretary's telephone to call parents of students who have been absent or are behind in their work.

You spend roughly 12 hours each week correcting papers, because you believe your students should write a theme each week. You feel guilty that this allows you to spend only 5 minutes per paper. You spend another 6 hours each week preparing for your five different sections, mostly writing up the behavioral objectives required by the system's curriculum guide, which you find meaningless and even counterproductive to your goals for your students. You do all of this after school hours, because your one preparation period is devoted to preparing attendance forms, doing other administrative paperwork, and meeting with students who need extra help. Between classes, you monitor hallways and restrooms, supervise the lunch room, and track down truants.

You are frustrated that the district's new competency-based curriculum is forcing you to spend more and more of your time teaching students to answer multiple-choice questions about the mechanics of grammar. Meanwhile, your efforts to teach writing and critical thinking are discouraged, as they do not seem to fit with the district's mandated curriculum and testing program. You have no input into decisions about curriculum, teaching methods, materials, or resource allocations. You will, of course, never get a promotion; nor will you have an opportunity to take on new responsibilities. You receive frequent feedback about public dissatisfaction with schools and teachers, but little reinforcement from administrators or parents that your work is appreciated. Sometimes you wonder whether your efforts are worth the $15,000 a year you earn for them.

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[20] Ibid., pp. 76–78; National Education Association, *Nationwide Teacher Opinion Poll, 1983*, p. 9; American Federation of Teachers, *Schools as a Workplace: The Realities of Stress*, Vol. 1, 1983, pp. 15–17.

This description is not an overdramatization. It reflects the modal conditions of teaching work in this country today. The importance of professional working conditions to teacher satisfaction and retention has recently been recognized in a number of studies at Rand and elsewhere. Conditions that undermine teacher efficacy, i.e., the teacher's ability to do an effective job of teaching, are strongly related to teacher attrition. These conditions include lack of opportunity for professional discourse and decisionmaking input; inadequate preparation and teaching time; and conflict with or lack of support from administrators.[21]

A particularly troubling aspect of teachers' dissatisfaction with their working conditions is that the most highly qualified teachers are the most dissatisfied. Chart 11 summarizes some results from a recent Rand study of teachers' views of their work environment.[22] Those with academic majors (i.e., those who have a bachelor's or master's degree in their discipline in addition to a teaching certificate) are more dissatisfied with the lack of administrative support for their work, with bureaucratic interference in their work, with their lack of autonomy, and with salaries and other working conditions than are those with education degrees only. Academic majors have typically taken substantially more college coursework in their area of specialization than education majors, and they also tend to be the teachers who hold more advanced degrees. These highly qualified individuals are the kinds of teachers that many would like to attract to and retain in teaching, yet they are the ones most frustrated by the profession's current work environment. They are also much more likely than other teachers to say they plan to leave teaching.

Unfortunately, the approach to improving education reflected in most of the policy initiatives of the past decade has done little to increase the attractiveness of teaching; it may, in fact, have

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[21] See, for example, Linda Darling-Hammond and Arthur E. Wise, "Teaching Standards or Standardized Teaching?," *Educational Leadership*, October 1983, pp. 66–69; Susan J. Rosenholtz and Mark A. Smylie, *Teacher Compensation and Career Ladders: Policy Implications from Research*, Paper commissioned by the Tennessee General Assembly's Select Committee on Education, December 1983; D. W. Chapman and S. M. Hutcheson, "Attrition from Teaching Careers: A Discriminant Analysis," *American Educational Research Journal*, Vol. 19, 1982, pp. 93–105; M. D. Litt and D. C. Turk, *Stress, Dissatisfaction, and Intention to Leave Teaching in Experienced Public High School Teachers*, Paper presented at the annual meeting of the American Educational Research Association, Montreal, April 1983.

[22] Data are from an ongoing study of the conditions of teaching work being conducted by Arthur E. Wise and Linda Darling-Hammond.

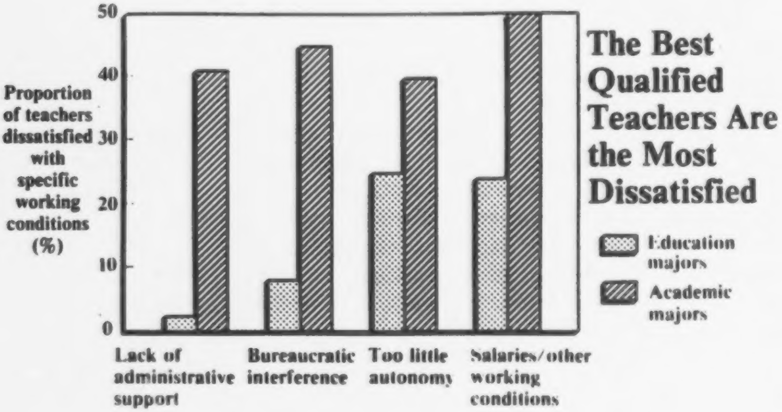

Chart 11

exacerbated the problem. Based on a factory model of schooling in which teachers are semi-skilled, low-paid workers, at least two-thirds of the states enacted policies in the 1970s that sought to standardize and regulate teacher behaviors. Elaborate accountability schemes such as management-by-objectives, competency-based education, minimum-competency testing, and other efforts to develop a teacherproof curriculum were imposed in the belief that if teachers do exactly as they are told, students will learn exactly as they are supposed to.[23] Bureaucratic controls on teaching behaviors were used as an alternative to upgrading the quality of teachers or of professional decisionmaking. As Porter notes:

> The accountability movements of the 1970s view teachers not as autonomous decisionmakers but as agents of public school policymakers, agents subject to hierarchical controls.[24]

These policies have not had the desired effect, because they are based on an inappropriate model of teaching and learning. Indeed, they have had some dysfunctional consequences. Teachers resist bureaucratic attempts to constrain their classroom decisions,[25] not because they are opposed to accountability, but because standardized teaching prescriptions reduce their ability to teach effectively.[26] Highly prescriptive teaching policies often limit the curriculum to those subjects and types of thinking that are most easily tested; such policies also prevent the use of alternative teaching strategies that are more appropriate to students' learning needs and create paperwork burdens that detract from teaching time.[27] The results are twofold: emphasis on procedural conformity to narrowly configured objectives at the expense of more creative forms of teaching and learning; and dissatisfaction on the part of teachers who find their ability to respond to students' needs reduced.

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[23] Arthur E. Wise, *Legislated Learning: The Bureaucratization of the American Classroom*, Berkeley: University of California Press, 1979.

[24] Andrew C. Porter, et al., *Teacher Autonomy and the Control of Content Taught*, Institute for Research on Teaching, Michigan State University, December 1979, p. 4.

Research on effective teaching suggests a very different model for improving education. Studies conducted over the past two decades show that students have different learning styles, and that effective teaching techniques vary for students of different characteristics and at different stages in their development, for different subject areas, and for different learning goals.[28] Appropriate teaching techniques must be determined by diagnosing student needs and matching those diverse needs to appropriate methods of instruction. In this context, professional judgment is a prerequisite for good teaching, because unless students are treated according to their *particular* learning needs, they will be mistreated. Standardized practice is, in essence, malpractice. The need for diagnosis of individual situations and for judgments about appropriate strategies and tactics is what defines a profession.[29]

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[25] Darling-Hammond and Wise, *A Conceptual Framework for Examining Teachers' Views*, pp. 56–57; Lortie, *Schoolteacher*, p. 164; Jackson, *Life in Classrooms*, p. 129; R. G. Corwin, *Militant Professionalism: A Study of Organizational Conflict in High Schools*, Meredith Corporation, 1970; Harry F. Wolcott, *Teachers vs. Technocrats*, University of Oregon Center for Educational Policy and Management, 1979.

[26] Linda Darling-Hammond and Arthur E. Wise, "Beyond Standardization: State Standards and School Improvement," *Elementary School Journal* (forthcoming); Lee S. Shulman, "Autonomy and Obligation," in L. S. Shulman and Gary Sykes (eds.), *Handbook of Teaching and Policy*, New York: Longman, 1983; Michael Lipsky, *Street-Level Bureaucracy*, Russell Sage Foundation, 1980.

[27] Darling-Hammond and Wise, "Beyond Standardization"; Anne M. Bussis, "Burn It at the Casket: Research, Reading Instruction, and Children's Learning of the First R," *Phi Delta Kappan*, December 1982, pp. 237–241; Constance Kamii, "Encouraging Thinking in Mathematics," *Phi Delta Kappan*, December 1982, pp. 247–251; Harriet Talmage and Sue Pinzur Rasher, "Unanticipated Outcomes: The Perils to Curriculum Goals," *Phi Delta Kappan*, September 1980, pp. 30–32, 71.

[28] See, for example, W. Doyle, "Paradigms for Research on Teacher Effectiveness," in Lee S. Shulman (ed.), *Review of Research in Education, Vol. 5*, Itasca, Illinois: F. E. Peacock, 1978; M. J. Dunkin and B. J. Biddle, *The Study of Teaching*, New York: Holt, Rinehart and Winston, 1974; F. J. McDonald and P. Elias, *Executive Summary Report: Beginning Teacher Evaluation Study, Phase II*, Educational Testing Service, 1976; L. J. Cronbach and R. E. Snow, *Aptitudes and Instructional Methods: A Handbook for Research on Interactions*, New York: Irvington, 1977; N. L. Gage, *The Scientific Basis of the Art of Teaching*, New York: Teachers College Press, 1978; J. E. Brophy and C. M. Evertson, *Learning from Teaching: A Developmental Perspective*, Boston: Allyn and Bacon, 1976.

Our own research on teachers reinforces this view. Teachers find that uniform teaching prescriptions prevent them from attending to the variable needs of their students and to the conceptual demands of their academic disciplines. In one study, 45 percent of the teachers we interviewed said they would resign from teaching if prescriptiveness of teaching content and methods increased.[30] For them, a non-professional work structure diminished the satisfactions of their work to an unacceptable degree. Future policies ought to respond to the fact that these professional incentives are very important to teachers.

Professionalizing Teaching

The many factors that discourage qualified people from entering and remaining in the teaching profession are converging at a time when teacher retirements and student enrollment trends are leading to increased demand for teachers. As a consequence, it will be necessary to hire and retain large numbers of marginally qualified people into teaching unless major changes are made in the structure of the occupation.

Higher salaries for teachers are only part of the solution to the problem. The non-pecuniary aspects of teaching are at least as important as salaries in attracting and retaining good teachers. (In any case, the public is not likely to support higher salaries if serious efforts are not made to upgrade the perceived quality of the teaching force.) As in other occupations, improved working conditions for teachers are a partial substitute for higher wages. A particularly important aspect of those working conditions is the degree of professionalism allowed in the work structure. Upgrading the quality of teacher preparation and creating more professional working conditions are part of a structural solution, one that attends to the interrelated causes of the problem rather than merely to its symptoms. In fact, teaching is now much like the legal and medical professions were at the turn of the century. Until fundamental changes were made in the structure of these professions, they, too, were characterized by low wages, easy access, poor training, no real standards of practice, and a poor public image.

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[29] Linda Darling-Hammond, Arthur E. Wise, and Sara R. Pease, "Teacher Evaluation in the Organizational Context: A Review of the Literature," *Review of Educational Research*, Vol. 53, No. 3, Fall 1983, pp. 285–328; Gage, *The Scientific Basis of the Art of Teaching*, p. 15; Harry S. Broudy, "Teaching—Craft or Profession?," *The Educational Forum*, January 1956, pp. 175–184.

[30] Darling-Hammond and Wise, "Teaching Standards or Standardized Teaching?," p. 69.

What would it mean to "professionalize" teaching? The following features that characterize most modern professions serve to ensure and allow competent performance:

- Rigorous entry requirements
- Supervised induction
- Autonomous performance
- Peer-defined standards of practice
- Increased responsibility with increased competence

Entry requirements are rigorous because the work requires mastery of a body of knowledge. Induction into the occupation is supervised by experienced practitioners because developing professional judgment means learning how to translate theory into practice. Performance after induction is autonomous because treatment must be tailored to the clientele and their specific needs. Peers define standards of practice because specialized expertise is the basis for informed judgment, and standardized procedures cannot meet the demands of the work. Tying increased responsibility to demonstrated competence is the means by which professional standards of practice are promulgated and conveyed. Experienced practitioners induct new entrants and are responsible for technical decisions.

On the basis of these characteristics, we make the following recommendations for reforming the teaching profession. First, establish professionally competitive salaries for teachers; in the current marketplace, this means starting salaries of $20,000 with career increases of up to $50,000 (the salary level of middle-management school employees). Second, offer recruitment incentives such as scholarships and forgivable loans for academically talented college students to enter teaching, similar to the National Defense and Education Act loans of the 1960s. Third, improve teacher education by making it more intellectually rigorous and requiring internships supervised by senior teachers before tenure is granted. Fourth, improve working conditions by allowing paraprofessionals to assume the non-teaching duties now performed by teachers and by allowing teachers more time to teach, to prepare, and to share in instructional decisionmaking. Fifth, allow experienced teachers to assume responsibilities for supervising new teachers and for developing programs as they move up a more differentiated career ladder with specific evaluation and promotion points. Taken together, these reforms suggest a new career structure in which professionally enforced standards of practice are combined with increased responsibility for technical decisionmaking by those who successfully demonstrate their competence.

Although these proposals start with higher salaries for teachers, they also imply changes in resource allocations within schools. As bureaucratization took hold in American schools, teacher salaries slipped from 49 percent of educational expenditures in 1972 to only 38 percent in 1982.[31] Changing the teaching career structure would also change administrative structures and roles, and hence the allocation of educational dollars. If teachers were to assume many of the instructional tasks currently performed by administrators (e.g., curriculum development and supervision), the layers of bureaucratic hierarchy could be reduced. Of course, further study will be needed to determine how administrative structures could be changed and to inform strategic planning efforts at the local level. However, we believe that efforts in these directions can lead to a more professional and more instructionally productive approach to schooling as well as to teaching. Reduced bureaucratic accountability demands would allow schools to become more client-oriented; and within a professional accountability structure, teachers could rely on peer support and assistance in working out problems of practice.[32]

Restructuring the teaching occupation is not a trivial undertaking. These proposals entail substantial costs; they are politically difficult, particularly in the light of public perceptions of low teacher quality; and they require some profound organizational changes, which are never easy to initiate. However, there are some opportunities for change that could offset these obvious barriers.

The attention to education generated by the recent commission reports has created a climate for reform that is in fact causing a great many states to entertain new proposals. Several states have already increased teachers' salaries and are trying to implement some kind of teacher incentive program. The coming large-scale retirements of teachers will provide new opportunities in two ways. First, the very experienced, expensive teachers will be replaced with less expensive teachers, so that the costs of upgrading salaries can be absorbed over a longer period of time. Second, it is more feasible and cost-effective to restructure induction into the profession when a major change in the membership of the work force is occurring. Finally, the costs of the reforms are not as enormous as they might at first appear. As noted above, some reallocation of resources is implicit in a new career structure. Furthermore, as fewer of the educational dollars have been spent on teachers over the last decade, fewer dollars have also been spent on education. Public elementary and secondary education expenditures dropped from 5.5 percent of personal income to 4.6 percent between 1972 and 1982.[83] We can, if we choose, return to a higher level of commitment to education.

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[31] C. Emily Feistritzer, *The Condition of Teaching: A State by State Analysis*, The Carnegie Foundation for the Advancement of Teaching, 1983, p. 50.

[32] Research on effective schools suggests that collegial settings in which teachers assist each other and solve problems collectively enhance teacher satisfaction and efficacy, along with student learning outcomes. See, for example, Rosenholtz and Smylie, *Teacher Compensation and Career Ladders*; P. T. Ashton, R. B. Webb, and N. Doda, *A Study of Teachers' Sense of Efficacy: Final Report*, The University of Florida, 1983; H. J. Walberg and W. J. Genova, "Staff, School, and Workshop Influences on Knowledge Use in Educational Improvement Efforts," *Journal of Educational Research*, Vol. 76, 1982, pp. 67–80; Wilbur Brookover, *Schools Can Make a Difference*, Michigan State University, 1977; Paul Berman and Milbrey W. McLaughlin, *Federal Programs Supporting Educational Change, Vol. 7: Factors Affecting Implementation and Continuation*, The Rand Corporation, R-1589/7-HEW, April 1977.

In addition to asking about the barriers and opportunities for significant reforms, we should also ask what the alternatives are. If we choose to ignore the structural problems of the teaching profession, we will in a very few years face shortages of qualified teachers in virtually every subject area. We will be forced to hire the least academically able students to fill these vacancies, and they will become the tenured teaching force for the next two generations of American school children.

If we are serious about improving the quality of education, we will have to make more than marginal changes in the attractiveness of the teaching profession. The search for excellence as it is being conducted in most states will not solve the problem. Fundamental reform of the teaching profession will be required.

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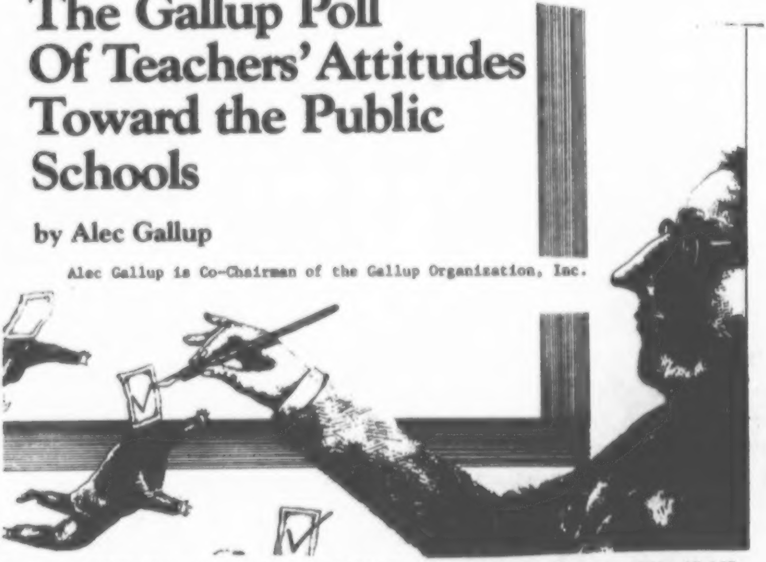
[83] Feistritzer, *The Condition of Teaching*, pp. 51–52.

The Gallup Poll Of Teachers' Attitudes Toward the Public Schools

by Alec Gallup

Alec Gallup is Co-Chairman of the Gallup Organization, Inc.



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Purpose of the Study

This is the first installment of the first Gallup/Phi Delta Kappa survey of the attitudes of U.S. teachers toward the public schools. The primary purposes of this survey were to determine teacher attitudes and to establish basepoint or benchmark measurements from which to track opinion trends in subsequent surveys. A secondary purpose was to compare teacher attitudes about key topics with the views of the general public, including parents of children enrolled in the public schools.

Just as with the other Gallup/PDK joint project — the Gallup Poll of the Public's Attitudes Toward the Public Schools — this poll is valuable in at least two important ways. First, it alerts decision makers to teachers' reactions to a variety of school programs and policies. Second, it serves as a benchmark against which local attitudes can be measured.

Local officials are welcome to use questions asked in this survey. The questions are not copyrighted. Moreover, no limits are placed on the use of information contained in this report, beyond customary credit to source and observance of the canons of accuracy and completeness of quotation.

Funding for this survey was provided by Phi Delta Kappa, Inc. To be sure that the survey would deal with the issues of greatest concern to both educators and the public, Phi Delta Kappa solicited suggestions for questions from a wide range of leaders in the field of education.

The second installment of this survey of teachers will appear in the January 1985 *Kappan*. Some of the topics to be covered in that poll will be teachers' views on the curriculum, on several of the recommendations for education of the various national commissions and task forces, on the desirability of teaching as a profession, and on the effects of teacher unions on education. — The Editors

Research Procedure

The findings of this survey come from mail interviews with a representative sample of U.S. teachers. From a list provided by Market Data Retrieval, a sample of 2,000 teachers was selected to reflect the total national population of teachers. The sample was stratified proportionately by region and by teaching level.

Questionnaires were mailed to the 2,000 teachers between 30 April and 9 May 1984. Six questionnaires were undeliverable, producing an effective mailing of

Nine teachers in 10 state that their salaries are too low. And almost nine in 10 say that low pay is the reason why teachers are leaving the profession.

1,994 questionnaires. Of these, 813 (41%) were completed and returned.

To insure that the attitudes of nonrespondents were not significantly different from those of respondents, a telephone survey was conducted with a sample of 100 teachers who had not answered the mail survey. The results of the telephone survey showed that the sample of nonrespondents to the mail survey closely paralleled the sample of respondents — both in terms of attitudes and in terms of socioeconomic and demographic characteristics.

Summary of Findings

Attitudes of American teachers are markedly uniform. Very few differences in attitudes are apparent among the nine subgroups in the teacher population by which the data were analyzed. Only in the case of elementary and high school teachers do differences in views emerge — and then only rarely.

At the same time, the attitudes of teachers and the public are frequently at odds. Of the approximately 30 issues in the two installments of this teacher poll on which the opinion of the public is also available, teachers and the public agree on one-third of the issues and disagree on two-thirds.

Grading the schools. American teachers give high marks to U.S. public schools. Asked to grade the local public schools, using the traditional grading system, two-thirds of the teachers award the local schools either an A or a B. When asked to grade the school in which they themselves teach, an even higher percentage (72%) award an A or a B.

Grading teachers, administrators, school boards, and parents. The same favorable attitude is also apparent when teachers are asked to rate other members of the teaching profession; however, teachers are less positive about the performance of administrators in the public schools and about local school boards. Almost eight teachers in 10 (78%) would award their peers an A or a B, but substantially fewer would give administrators and school board members top grades. Teachers' grades for parents fall far below those they give to teachers, administrators, and school board members. Asked to grade the job that local parents are doing in bringing up their children, only one teacher in five gives parents an A or a B.

The U.S. public rates the performance of teachers considerably lower than the teachers rate themselves; only 50% of the public gives teachers a grade of A or B. (The public gives principals and administrators about the same rating as it gives teachers.) On the other hand, the public rates school boards somewhat higher than teachers do — 41% of the public give school boards an A or a B, but only 29% of the teachers give them top grades. Thirty-three percent of the public give parents an A or a B — the lowest percentage for any group rated, but still a good deal higher than the grades assigned to parents by teachers.

Teacher compensation. A major source of teacher dissatisfaction involves what teachers perceive as poor compensation. For example, nine teachers in 10 state that their salaries are too low. And almost nine in 10 say that low pay is the reason why teachers are leaving the profession. Similarly, when asked for ways to reduce school costs, only 5% react favorably to the idea of cutting teacher salaries. The public tends to agree — but by a significantly smaller percentage — that teachers are paid too little.

Merit pay. U.S. teachers, including all major subgroups in the teacher population, oppose the idea of merit pay by a 2-1 ratio. Teachers' objections to merit pay center on two main points: 1) the difficulties in evaluation (i.e., determining who should receive merit pay) and 2) the morale problems that might be created if merit pay plans were put into effect.

At the same time, however, fully three-quarters of U.S. teachers admit that some teachers in their own schools are outstanding enough to warrant merit pay. Asked to estimate the percentage of teachers in their own schools who deserve merit pay, teachers who favor merit pay say about 33%.

If merit pay were adopted by the local schools, teachers would want fellow teachers, administrators, or educators from outside the district — rather than noneducators — to decide who should receive it. Only about one-fifth of teachers feel that either students or parents should be involved in this decision.

Similarly, teachers feel that the criteria to be used in selecting candidates for merit pay should be 1) an evaluation by educators, either teachers or administrators, and 2) an advanced degree or years of experience. A relatively small percentage of teachers feel that students' academic achievement or improvement, students' evaluations of teachers, or parents' opinions should influence the awarding of merit pay.

The views of the public provide a rather dramatic contrast to the attitudes of teachers. The public favors merit pay for teachers by a ratio of 4-1 (76% to 19%). The public also feels that the most important criterion upon which to base merit pay should be the academic achievement or improvement of students as measured by standardized tests (68%). Only 39% of teachers agree.

Attitudes concerning some recommendations of the national commissions and task forces on education. The attitudes of U.S. teachers are mixed regarding the recommendations for improving the public schools that have been made by the recent wave of national commissions and task forces on education. By wide margins, teachers favor higher salaries for teachers and state board examinations to prove teachers' knowledge of subject matter. By a somewhat smaller margin, they favor tougher college entrance requirements. Unlike teachers, the public opposes tougher admissions standards for colleges and universities.

School discipline. U.S. teachers have a much different perception of the problem of discipline in the public schools than does the public. Teachers feel that the most important problem facing local public schools —

Teachers feel that the most crucial problem facing local public schools — named by 31% of the respondents — is lack of parental support, not lack of discipline.

named by 31% of the respondents — is lack of parental support, not lack of discipline. Only about one teacher in six (16%) says that discipline is a very serious problem in the local schools.

In addition, nonacademic disciplinary problems — e.g., incomplete assignments, cheating, talking back to teachers, and truancy — are mentioned frequently by teachers as occurring "most of the time" or "fairly often." A relatively small percentage of teachers say that criminal activities — i.e., vandalizing or theft of property, use or selling of drugs or alcohol, carrying of weapons, physical attacks on students or staff — occur in their schools "most of the time" or "fairly often."

The public's perceptions of discipline in the schools differ considerably from those of teachers, however. The public has named discipline as the most important problem facing the public schools since the Gallup surveys of attitudes toward the schools began in 1969. One-third of the public in 1984 — compared to 16% of teachers — believe that disciplinary problems in the local schools are very serious. Most significant, however, the public perceives violence and criminal activities as much more prevalent in the schools than teachers do. Far larger percentages of the public than of teachers, for example, say that a variety of these kinds of problems occur "most of the time" or "fairly often."

Teachers blame disciplinary problems on outside influences — specifically, the courts, lack of respect for authority, and especially lack of discipline in the home, which is mentioned by virtually all teachers (94%). Only about one-third of the teachers feel that teachers themselves are at fault.

The public agrees, although by a smaller percentage than teachers, that the principal source of disciplinary problems is lack of discipline in the home. On the other hand, the public is more prone to blame teachers for disciplinary problems.

Testing. Teachers are divided on the value of public school testing programs. A slight majority oppose exams for grade promotion, and an even smaller majority favor exams for high school graduation. Two-thirds of those who approve of an exam for high school graduation feel that the results should be released to the public — and compared with results from other schools that serve the same racial and socioeconomic mix.

The public's view differs markedly from that of teachers on the issue of testing. Although the public approves of an exam for high school graduation by a wide 7-3 ratio, only half of those who favor the exam also favor the release of results to the public and approve of comparing the results with those of other schools.

School prayer. Elementary teachers favor voluntary school prayer by a 2-1 ratio. High school teachers are much more closely divided on this issue than are elementary school teachers. The public approves of school prayer by a wider margin, 4-1.

Politics. Asked which Presidential candidate would be more likely to improve the quality of education in the U.S., teachers name Walter Mondale by a ratio of nearly 2-1, 42% to 25%. The U.S. public also feels that Mondale would be more likely than Reagan to improve American education, but Mondale's lead over Reagan on this issue is not quite as great with the public (42% to 34%) as with teachers.

Teachers Grade the Public Schools

American teachers give high marks to the U.S. public school system. Asked to grade the public schools in their community using the traditional A-through-F grading system, two-thirds of American teachers give the schools a mark of A or B. Only 4% give the schools a D, and 1% give them a failing grade. When asked to grade the schools in which they themselves teach, the percentage of teachers who give the schools an A or a B rises to 72%.

The question:

Students are often given the grades A, B, C, D, and FAIL to denote the quality of their work. Suppose the public schools themselves, in this community, were graded in the same way. What grade would you give the public schools here? How about the public school in which you teach? What grade would you give your own school?

	Local Schools	Your Own School
	%	%
A rating	12	21
B rating	52	51
C rating	27	20
D rating	4	4
FAIL	1	2
Don't know	4	2

Teachers Grade Teachers, Administrators, School Boards, and Parents

American teachers are even more positive about the performance of teachers than they are about the performance of the schools, with 75% awarding teachers an A or a B. However, this highly favorable attitude does not carry over to the performance of others involved in local education — principals and other administrators, local school boards, or the parents of students attending the local schools.

Only 44% of teachers feel that the job done by principals and other administrators in the local schools deserves either an A or a B. Fewer than one teacher in three (29%) would award the local school board either an A or a B, with 13% giving it a failing grade.

At the bottom of the list are the parents of local schoolchildren, who receive an A or a B for their efforts from only one teacher in five (21%). A larger percentage of teachers (31%) give parents a D or an F.

The question:

What grade would you give the teachers in the local public schools? The administrators in the local public schools? The local school board?

What grade would you give the parents of students in the local public schools for bringing up their children?

	Teachers	Administrators	Local School Board	Parents
	%	%	%	%
A rating	18	10	4	2
B rating	60	34	25	19
C rating	17	34	36	46
D rating	2	15	19	24
FAIL	*	5	13	7
Don't know	3	2	3	3

Teacher Opinion vs. Public Opinion

Although the grades the public gave the schools in 1984 were the highest recorded in a decade, they were still much lower than the grades the teachers give the schools. Almost two-thirds of American teachers (64%) give the local schools an A or a B; only about four in 10 (42%) of the general population did so.

Differences between the public's and the teachers' views also show up in the grades these groups award to teachers, administrators, local school boards, and parents. Although the public grades teachers somewhat higher than it grades the local schools, only 50% of the public give teachers a grade of A or B, a substantially lower figure than the 75% of teachers who give their peers an A or a B.

Although teachers grade administrators considerably lower than they do their peers, the U.S. public rates administrators about the same as it does teachers. On the other hand, the U.S. public grades both school boards and parents higher than American teachers do. Forty-one percent of the public give the school board an A or a B; only 29% of teachers do so.

Both the public and teachers rate parents the lowest. Only one-third of the public and 21% of teachers give parents a grade of A or B.

	Local Schools	
	All Teachers	U.S. Public
	%	%
A rating	12	10
B rating	52	32
C rating	27	35
D rating	4	11
FAIL	1	4
Don't know	4	8

Teachers Grade Teacher Education

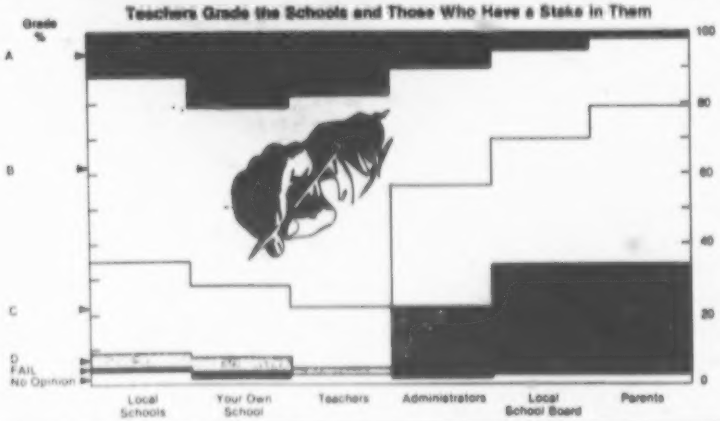
About half of U.S. teachers in every major subgroup of the teacher population would give the teacher education program they attended a grade of A or B. Collectively, 10% of teachers would award their teacher training programs a grade of D, and 6% would give their teacher training programs a failing grade.

The question:

What grade would you give the teacher education training you received?

	All Teachers	Elementary Teachers	High School Teachers
	%	%	%
A rating	14	14	14
B rating	36	37	34
C rating	33	34	31
D rating	10	8	11
FAIL	6	4	8
Don't know	2	3	2

Teachers Grade the Schools and Those Who Have a Stake in Them



Presidential Candidates

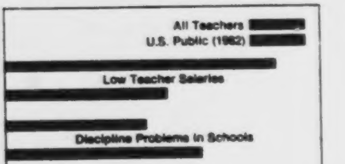
Asked which Presidential candidate, Ronald Reagan or Walter Mondale, would be more likely to improve the quality of education in the U.S., American teachers name Mondale by a ratio of nearly 2-1, 42% to 25%. About one-third say that there would be no difference between the candidates or have no opinion.

Although the American public also feels that Mondale would be more likely than Reagan to improve American education, the ratio is much smaller (42% to 34%).

The question:

Which Presidential candidate do you feel would be more likely, as President, to improve the quality of public education in the U.S. — Ronald Reagan or Walter Mondale?

Reasons for Leaving Teaching



	All Teachers %	Elementary Teachers %	High School Teachers %	U.S. Public %
Walter Mondale	42	41	44	42
Ronald Reagan	25	25	25	34
No difference/ no opinion	33	34	31	24

School Prayer

Elementary school teachers favor voluntary school prayer by roughly a 2-1 ratio. High school teachers are much more closely divided on the issue, favoring school prayer by 47% to 37%.

The American public approves of school prayer by a wider ratio (4-1) than teachers. At the same time, however, there has been some decline in public support for school prayer in recent years.

The question:

Do you favor or oppose a proposed Amendment to the U.S. Constitution that would allow voluntary prayer in the public schools?

	All Teachers %	Elementary Teachers %	High School Teachers %	U.S. Public %
Yes	52	56	47	74
No	33	30	37	19
Don't know	15	14	16	7

Attracting and Retaining Good Teachers

Slightly more than one-third of U.S. teachers (37%) report that their schools have had difficulty in attracting good teachers, and about half (48%) say that their schools have had difficulty in retaining good teachers. In both instances the percentage is higher for high school than for elementary teachers.

The question:

Does the school in which you teach have difficulty in getting good teachers?

	All Teachers %	Elementary Teachers %	High School Teachers %
Yes	37	31	45
No	57	65	48
No opinion	6	4	7

The question:

Does the school in which you teach have difficulty in *keeping* good teachers?

	All Teachers %	Elementary Teachers %	High School Teachers %
Yes	48	43	55
No	47	52	39
No opinion	5	5	6

Why Teachers Leave the Profession

Respondents were shown a card listing a number of problems that affect the teaching profession, and they were asked which three problems they feel are the main factors causing teachers to leave their jobs. Low salaries are by far the most frequently cited, with almost nine in 10 teachers (87%) mentioning this reason.

The question:

Many public school teachers are leaving the classroom. Here are some reasons that are sometimes given. Which three of these do you think are the main reasons why teachers are leaving their jobs?

	All Teachers %	Elementary Teachers %	High School Teachers %
Low teacher salaries	87	85	89
Discipline problems in schools	46	49	41
Low standing of teaching as a profession	36	37	35
Students are unmotivated, uninterested in school	37	31	41
Lack of public financial support for education	28	24	33
Parents don't support the teachers	21	25	16
Outstanding teacher performance goes unrewarded	20	16	25
Difficulty of advancement	15	13	19
Parents are not interested in children's progress	11	11	11

(Figures add to more than 100% because of multiple answers.)

☑ Teacher Opinion vs. Public Opinion ☑

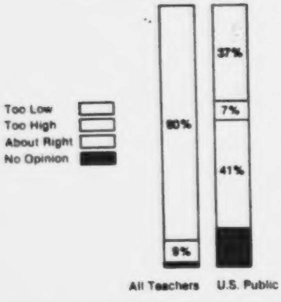
The public, surveyed in 1982, differed from the teachers as to why teachers leave the profession. Only 52% of the public mentioned low teacher salaries as one of the main reasons why teachers leave; 63% cited discipline as one of the main factors.

Paradoxically, the public was much more likely than teachers to see parents' lack of interest in their children's progress as a reason for teachers to leave the profession. Twenty-five percent of the public mentioned this reason, but only 11% of teachers do. Similarly, 37% of the public said that lack of support from parents is one of the factors causing teachers to leave the profession, whereas only 21% of teachers cite this as a reason.

Reasons for Leaving	All Teachers %	U.S. Public (1982) %
Low teacher salaries	87	52
Discipline problems in schools	46	63
Low standing of teaching as a profession	36	15
Students are unmotivated, uninterested in school	37	37
Lack of public financial support for education	28	34
Parent don't support the teachers	21	37
Outstanding teacher performance goes unrewarded	20	13
Difficulty of advancement	15	14
Parents are not interested in children's progress	11	25

(Figures add to more than 100% because of multiple answers.)

Salaries of Teachers



Teacher Compensation

Nine out of 10 teachers say that teacher salaries are too low; virtually none say that teacher salaries are too high.

The question:

Do you think salaries for teachers in this community are too high, too low, or just about right?

	All Teachers %	Elementary Teachers %	High School Teachers %
Too low	90	89	90
Too high	*	*	*
Just about right	9	10	9
No opinion	1	1	1

*Less than one-half of 1%.

☑ Teacher Opinion vs. Public Opinion ☑

The public is divided almost evenly on the question of whether teacher salaries are too low or about right. Forty-one percent feel that teacher salaries are just about right, and almost as many respondents (37%) say that they are too low. Very few respondents (7%) think teacher salaries are too high.

	All Teachers %	U.S. Public %
Too low	90	37
Too high	*	7
Just about right	9	41
No opinion	1	15

*Less than one-half of 1%.

Differential Pay in Subject Areas With Teacher Shortages

A number of observers have suggested that more pay be given to teachers in areas of critical national need, such as science, mathematics, and vocational/technical subjects. Three-fourths of teachers oppose such a measure. The public is more evenly divided on this

Charts by Mary Miller

issue, with 48% in favor of differential pay and 43% opposed.

The question:

> Today there is a shortage of teachers in science, math, technical subjects, and vocational subjects. If your local schools needed teachers in these subjects, would you favor or oppose paying them higher wages than teachers of other subjects?

	All Teachers %	Elementary Teachers %	High School Teachers %	U.S. Public %
Favor	21	18	25	48
Oppose	75	80	70	43
No opinion	4	2	5	9

Merit Pay

American teachers oppose the idea of merit pay by a 2-1 ratio, 64% to 32%. This ratio is consistent across all major teacher population subgroups.

The question:

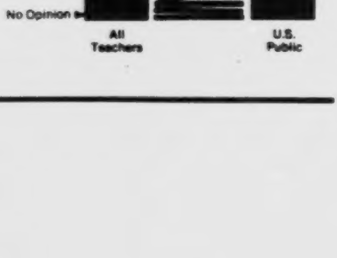
> How do you, yourself, feel about the idea of merit pay for teachers? In general, do you favor or oppose it?

	All Teachers %	Elementary Teachers %	High School Teachers %
Favor	32	29	35
Oppose	64	67	62
No opinion	4	4	3

Reasons for Favoring/Opposing Merit Pay

Teachers oppose merit pay for two basic reasons: 1) the difficulty of evaluating teacher performance and 2) the morale problems that merit pay might cause.

Support for Adoption of Merit Pay For Teachers



Almost two-thirds of the teachers say that a committee of teachers should determine which teachers receive merit pay.

About one-fourth of the teacher respondents (23%) say that it would be difficult to give a *fair* evaluation of teaching. Twelve percent say that administrators could not give objective evaluations, and the same percentage say that teacher merit cannot be measured objectively at all.

About 12% of the teachers say that merit pay would create morale problems in their schools, and another 8% say that it would present political problems in the schools.

The question:

> Why do you favor/oppose merit pay for teachers?

	All Teachers %	Elementary Teachers %	High School Teachers %
Oppose			
Difficult to give a fair evaluation	23	22	24
Would create problems/morale problems	12	14	10
Administrators can't evaluate fairly	12	12	13
Political problems	8	9	7
Can't be objectively measured	12	12	12
Other	5	4	5
Favor			
Good teachers would be rewarded	25	23	27
Children would benefit	1	*	1
Other	7	8	6

(Figures add to more than 100 because of multiple answers.)
*Less than one-half of 1%.

What Percentage of Teachers Deserve Merit Pay?

Although U.S. teachers tend to oppose merit pay, three-quarters of them say that some teachers in their own schools deserve merit pay.

The question:

Aside from whether you favor or oppose merit pay, do you feel there are any teachers in the school where you teach who are sufficiently outstanding to warrant merit pay, or not?

	All Teachers %	Elementary Teachers %	High School Teachers %
Yes	76	72	81
No	16	19	11
No opinion	8	9	8

(IF FAVOR MERIT PAY) What percentage of teachers do you feel warrants merit pay?

	All Teachers %	Elementary Teachers %	High School Teachers %
Responses of Those Who Favor Merit Pay			
Under 10%	13	11	16
10% to 19%	23	22	25
20% to 29%	17	15	19
30% to 59%	23	25	20
60% to 99%	17	21	13
No answer	7	6	7
Average	33	36	30

Who Should Determine Which Teachers Receive Merit Pay?

Almost two-thirds of the U.S. teachers (63%) say that a committee of teachers should determine which teachers receive merit pay. Next most frequently mentioned as potential decision maker is the school principal (57%), followed by a committee of outside educators (42%). Only about one teacher in five wants the decision to be made by either students or parents.

The question:

Suppose that your own school were to adopt the merit pay plan. Who, in your opinion, should determine which teachers should be given merit increases?

	All Teachers %	Elementary Teachers %	High School Teachers %
Committee of teachers	63	62	65
School principal	57	60	53
Committee of outside educators	42	42	40
Students	22	18	26
Parents	19	21	17
Other	11	11	11
No one qualified	2	2	3
Don't know	3	3	4

(Figures add to more than 100% because of multiple responses.)

☑ Teacher Opinion vs. Public Opinion ☑

The views of the public differ dramatically from those of teachers on the issue of merit pay. The public favors merit pay for teachers by a ratio of 4-1.

Two-thirds of the public (66%) believe that academic achievement or the improvement of student performance as measured by standardized tests should be one of the criteria used to determine which teachers receive merit pay. Only 39% of the teachers agree. But 66% of the teachers feel that other teachers in the system should be involved in the evaluation of teachers for merit pay, while only 48% of the public agree.

	All Teachers %	U.S. Public %
Favor merit pay	32	76
Oppose merit pay	64	19
No opinion	4	5

	All Teachers (% favoring)	U.S. Public (% favoring)
Criteria for Awarding Merit Pay		
Administrators' evaluations	73	67
Evaluation by other teachers in the system	66	48
An advanced degree	53	56
Length of teaching experience	47	48
Academic achievement or improvement of students (as measured by standardized tests)	39	66
Students' evaluations	36	45
Parents' opinions	30	36

Major Problems Confronting The Public Schools

U.S. teachers say that the biggest problem confronting the public schools is parents' lack of interest and support (31%). The next most frequently mentioned problems — all cited by about one teacher in five — are lack of proper financial support, lack of interest or truancy on the part of pupils, and lack of discipline.

These responses are fairly consistent across all teacher population subgroups. One difference is that 35% of elementary school teachers mention parents' lack of interest, while only 26% of high school teachers mention this problem. On the other hand, 23% of high school teachers mention pupils' lack of interest or their truancy, while only 17% of elementary teachers do so.

The question:

What do you think are the biggest problems with which the public schools in this community must deal?

	All Teachers %	Elementary Teachers %	High School Teachers %	U.S. Public %
Parents' lack of interest/support	31	35	26	5
Lack of proper financial support	21	20	21	14
Pupils' lack of interest/truancy	20	17	23	4
Lack of discipline	19	20	18	27
Problems with administration	10	8	12	3
Poor curriculum/poor standards	7	7	7	15
Use of drugs	6	3	8	18
Low teacher salaries	5	5	5	4
Difficulty getting good teachers	4	3	4	14
Large schools/overcrowding	4	5	2	4
Teachers' lack of interest	4	5	4	5
Lack of respect for teachers/other students	4	4	4	3

	All Teachers	Elementary Teachers	High School Teachers	U.S. Public
	%	%	%	%
One-parent households	4	4	4	*
Lack of public support	3	3	4	*
Communication problems	3	4	3	1
Government interference/regulation	3	2	4	1
Integration/busing	2	2	2	6
Lack of proper facilities	2	2	3	2
School board policies	2	2	2	*
Parental involvement with school activities	2	3	2	1
Mismanagement of funds/programs	2	3	2	2
Moral standards	2	2	2	1
Drinking/alcoholism	2	2	3	4
Lack of needed teachers	2	2	1	1
Crime/vandalism	1	*	2	3

(Figures add to more than 100% because of multiple answers.)

*Less than one-half of 1%.

How Serious Is the Discipline Problem?

Whereas about one-third of the public (34%) feel that discipline is a very serious problem in the schools, only 16% of the teachers agree. About one-third of both groups see the discipline problem as fairly serious. Nearly half of the teachers see the problem of discipline as not too serious (35%) or not at all serious (14%), but only about a quarter of the public agree with these judgments.

The question:

> **How serious a problem would you say discipline is in the public schools in your community — very serious, fairly serious, not too serious, or not at all serious?**

	All Teachers	Elementary Teachers	High School Teachers	U.S. Public
	%	%	%	%
Very serious	16	17	15	34
Fairly serious	33	29	36	34
Not too serious	35	36	32	22
Not at all serious	14	12	17	4
No opinion	2	4	*	6

*Less than one-half of 1%.

Perceived Incidence of School Problems

Teachers differ markedly from the general public in their judgment of which of the problems confronting the schools are most important. The comparison is especially revealing with regard to criminal activities, which the public feels occur far more frequently than teachers do.

For example, 53% of the public feel that drugs are used at school "most of the time" or "fairly often." Only 17% of teachers agree. Almost half of the public (47%) but only 13% of the teachers think that drugs are sold at school "most of the time" or "fairly often."

About one-third of the public feel that alcoholic beverages are drunk at school "most of the time" or "fairly often," that school property is stolen "most of the time" or "fairly often," and that knives, firearms, and weapons of other kinds are carried at school "most of the time" or "fairly often." Teachers report that these criminal activities take place much less frequently: drinking, 10%; theft of school property, 23%; carrying weapons, 8%. However, teachers and the public are in

Most Important Problems Facing the Public Schools

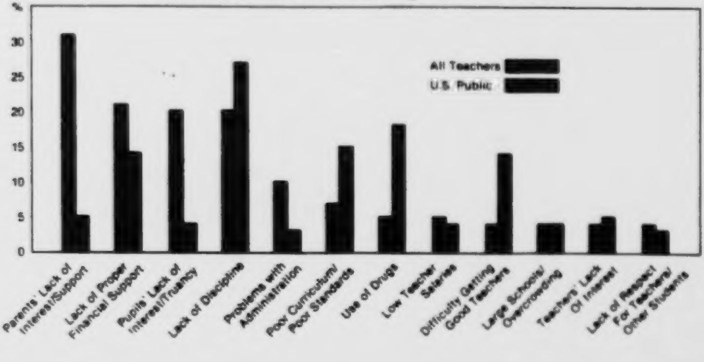


Chart by Mary Miller

closer agreement on how often such disciplinary problems as cheating, not completing homework, truancy, and so on occur.

The question:

About how often do each of the problems listed occur at the school where you teach?

	Respondents Who Say Most of the Time/Fairly Often	
	All Teachers %	U.S. Public %
Schoolwork and homework assignments not completed	76	64
Behavior that disrupts class	47	60
Truancy/being absent from school	47	53
Talking back to, disobeying teachers	43	58
Cheating on tests	40	46
Sloppy or inappropriate dress	37	47
Skipping classes	35	56
Stealing money or personal property belonging to other students, teachers, or staff	32	39
Vandalizing of school property	29	39
Theft of school property	23	34
Use of drugs at school	17	63
Selling of drugs at school	13	47
Drinking alcoholic beverages at school	10	35
Carrying of knives, firearms, or other weapons at school	8	29
Sexual activity at school	8	24
Racial fights between whites, blacks, Hispanics, or other minorities	4	22
Taking money or property by force, using weapons or threats	2	18
Physical attacks on teachers or staff	1	16

Reasons for Discipline Problems

Respondents were shown a list of potential reasons for discipline problems in the schools and asked to select those that they felt best explained why disciplinary problems exist. Teachers look outside the school for reasons to explain the disciplinary problems. For example, more than nine in ten (94%) say that lack of discipline in the home is one important reason for disciplinary problems in school, 74% cite lack of respect for law and authority throughout the society, 86% mention student troublemakers who cannot be removed from school, and 65% say that the courts have made administrators too cautious in dealing with student misbehavior.

The U.S. public tends to agree with teachers that lack of discipline in the home is the main cause of disciplinary problems in the schools. But the public mentions outside influences, including the home, less often than teachers do, and the public is much more likely to say that teachers are in part the cause of disciplinary problems — that teachers do not command respect, that teachers are not properly trained to deal with discipline problems, and that teachers fail to make classroom work interesting.

The question:

Many people say that "discipline" is one of the major problems of the public schools today. Would you please look over this list and check the reasons you think are most important to explain why there is a discipline problem?

	All Teachers %	U.S. Public (1983) %
Lack of discipline in the home	94	72
Lack of respect for law and authority throughout society	74	54
Students who are constant troublemakers often can't be removed from the school	86	42
The courts have made school administrators so cautious they don't deal severely with student misbehavior	65	41
Punishment is too lenient	50	39
Decline in teaching of good manners	46	37
One-parent families	42	26
Viewing television programs that emphasize crime and violence	39	39
Teachers themselves do not command respect	23	39
Teachers who are not properly trained to deal with discipline problems	19	42
Failure on the part of teachers to make classroom work more interesting	11	31

Support for Public School Testing

U.S. teachers are decidedly ambivalent about the merits of standardized achievement tests both for grade promotion and for graduation from high school.

Teachers are opposed to promotion from grade to grade on the basis of examinations; 43% say that they favor such tests, and 52% oppose them. They are more evenly divided on the question of a nationwide examination for high school graduation; 48% favor such a test, while 45% oppose it. Of the 48% who favor an examination for high school graduation, two-thirds feel that the outcomes should be released to the public, and virtually all favor comparing the exam results with those of other schools serving similar clienteles.

The question of testing for grade promotion is one of the few instances in this survey in which we found significant differences of opinion between elementary and high school teachers. Elementary teachers oppose an examination for grade promotion by a ratio of almost 2 to 1, while high school teachers favor promotion on the basis of an examination score by a margin of roughly 5 to 4.

Once again, teachers' attitudes are in stark contrast to those of the general public, which has for many years supported the notion of using standardized tests both for grade-to-grade promotion and for high school graduation. In the 1984 survey of the public's attitudes toward the public schools, the general public supported both of these uses of tests by a margin of about 3 to 1.

The question:

In your opinion, should children be promoted from grade to grade only if they can pass examinations?

	All Teachers %	Elementary Teachers %	High School Teachers %	U.S. Public %
Yes	43	33	54	71
No	52	63	40	25
No opinion	5	4	6	4

The question:

Should all high school students in the United States be required to pass a standard nationwide examination in order to get a high school diploma?

	All Teachers %	Elementary Teachers %	High School Teachers %	U.S. Public %
Should be required	48	52	44	65
Should not be required	45	41	50	29
No opinion	7	7	6	6

Remedial Classes or Repeating a Grade

Teachers are opposed to having a student repeat a year's work if that student fails a subject. Three-quarters of the teachers (78%) favor having such a student take special remedial classes in the subject he or she failed; only 13% would prefer having the student repeat the whole year.

In 1978 the public was in virtual agreement with our 1984 sample of teachers on how to treat failing students. Four-fifths of the public would have had such students take special remedial classes rather than repeating the subjects they fail.

The question:

Should students who fail be required to take special remedial classes in the subjects they fail, or should they be required to repeat the whole year's work?

	All Teachers %	U.S. Public (1978) %
Special remedial classes	78	81
Repeat whole year's work	13	14
No opinion	9	5

Raising College Entrance Requirements

Many educators have argued that raising the entrance requirements of colleges and universities would be an effective way of inducing the public schools to raise their standards. Teachers in this survey favor this proposal by a small margin (47% to 39%).

The general public, however, does not agree. The public has always favored tougher standards at the high school level, but it rejects, by a margin of 59% to 27%, the raising of college entrance requirements.

The question:

Do you feel that four-year colleges and universities should raise their entrance requirements or not?

	All Teachers %	U.S. Public %
Should	47	27
Should not	39	59
No opinion	14	14

A State Board Examination for Teachers

Approximately two-thirds of the teacher respondents say that they would favor a state board examination to prove their knowledge in the subjects they plan to teach. The U.S. public even more strongly favors the idea of a state board examination for teachers. Eighty-nine percent of the public support the idea.

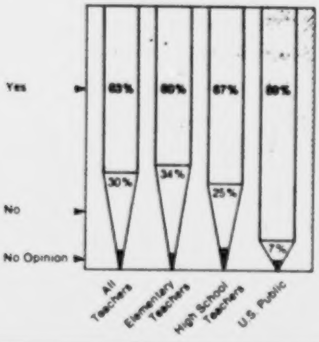
The question:

In addition to meeting college requirements for a teacher's certificate, should those who want to become teachers also be required to pass a state board examination to prove their knowledge in the subjects they will teach, before they are hired?

	All Teachers %	U.S. Public %
Yes	63	89
No	30	7
No opinion	7	4

Part 2 of the Gallup/Phi Delta Kappa Poll of Teachers' Attitudes Toward the Public Schools will appear in the January 1985 *Kappan*.

Support for State Board Examinations For Teachers

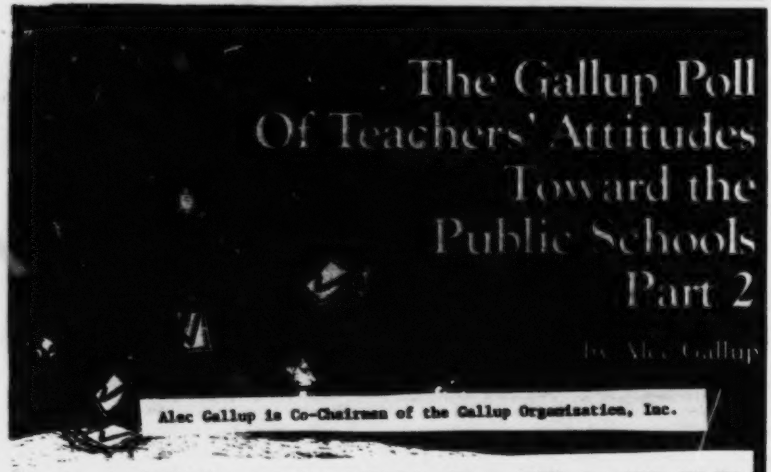


Ordering This Poll

In January 1985 Phi Delta Kappa will publish a book, *The Gallup/Phi Delta Kappa Poll of Teachers' Attitudes Toward the Public Schools*, which will contain the installment in this issue of the *Kappan* and the second installment to appear in the January 1985 issue.

Phi Delta Kappa will not be filling orders for reprints of this first portion of the poll. Orders will be taken only for the book.

Watch for an announcement in the January 1985 *Kappan* giving price and information on ordering.



The Gallup Poll Of Teachers' Attitudes Toward the Public Schools

Part 2

by Alec Gallup

Alec Gallup is Co-Chairman of the Gallup Organization, Inc.

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Research Procedure

The findings of this survey come from mail interviews with a representative sample of U.S. teachers. From a list provided by Market Data Retrieval, a sample of 2,000 teachers was selected to reflect the total national population of teachers. The sample was stratified proportionately by region and by teaching level.

Questionnaires were mailed to the 2,000 teachers between 30 April and 9 May 1984. Six questionnaires were undeliverable, producing an effective mailing of 1,994 questionnaires. Of these, 813 (41%) were completed and returned.

To insure that the attitudes of nonrespondents were not significantly different from those of respondents, a telephone survey was conducted with a sample of 100 teachers who had not answered the mail survey. The results of the telephone survey showed that the sample of nonrespondents to the mail survey closely paralleled the sample of respondents — both in terms of attitudes and in terms of socioeconomic and demographic characteristics.

Summary of Findings

As the first portion of this poll, published last October, revealed, attitudes of American teachers are remarkably uniform. Very few attitudinal differences are apparent among the nine subgroups in the teacher population by which the data were analyzed. Only in the case of elementary and high school teachers do differences in views emerge — and then only rarely.

At the same time, the attitudes of teachers and the public are frequently at odds. Of the approximately 30 issues in the two installments of this teacher poll on which the opinion of the public is also available, teachers and the public agree on one-third of the issues and disagree on two-thirds.

Desirability of teaching as a profession. Teachers are somewhat negative about the desirability of teaching as a profession. Teachers are about evenly divided on whether they would like a daughter to enter teaching, but they are against a son going into teaching by a ratio of 2 to 1 (59% to 31%).

By contrast, the public favors a daughter going into teaching by a ratio of about 5 to 4 (50% to 39%). The public is divided as to whether a son should enter the profession.

How teachers see themselves. Teachers rate their contribution to society the *highest* of 12 professions, including physicians, clergy, business executives, and lawyers. But they also feel that their status is the *lowest* of all of these professions.

The general public rates teachers' contribution to society somewhat lower than that of clergy or physicians. The public rates teachers' status in the community somewhat higher than the teachers themselves do.

Teacher unions/teacher strikes. U.S. teachers strongly support teacher unions and associations. By a 5 to 2 ratio, they believe that unions have contributed to public education; by a 2 to 1 ratio, they believe that teachers should have the right to strike.

By contrast, only about one person in five in the general public feels that teacher unions have improved the quality of public education. Twice as many believe that unions have hurt public education. The public also opposes, by a 2 to 1 ratio, giving teachers the right to strike.

Goals of education. A majority (56%) of teachers rate

Illustration by Kevin Page

developing good work habits, the ability to organize one's thoughts, and the ability to concentrate as a most important goal of education. The same percentage of teachers also rate the ability to think — creatively, objectively, and analytically — as a goal of the highest importance. A majority of teachers also cite developing the ability to speak and write, developing the ability to use mathematics for everyday problems, and encouraging the desire for lifelong learning as among the highest priorities of education.

Attitudes concerning some recommendations of the national commissions and task forces on education. The attitudes of U.S. teachers are mixed regarding the recommendations for improving the public schools that have been made by the recent wave of national commissions and task forces on education. By wide margins, teachers favor higher salaries for teachers and state board examinations to prove teachers' knowledge of subject matter (October *Kappan*).

The reform reports also made a number of recommendations for changing subject requirements. Virtually all teachers (95%) agree with the reports that English and math should be required of all students, not just the college-bound. Specifically, teachers recommend an average of 3.8 years of English for the college-bound and 3.6 years of English for the non-college-bound; 3.2 years of math for the college-bound and 2.7 years of math for the non-college-bound; 3.0 years of science for the college-bound and 2.7 years of science for the non-college-bound.

Fifty-nine percent of teachers would require all students to take computer science; 78% would require vocational training for the non-college-bound, and 48% would require some vocational education even for the college-bound. Seventy-seven percent of teachers would require about two years (2.1) of a foreign language for college-bound students.

The public's attitudes toward subject requirements are basically the same as those of teachers, with the exception that a smaller percentage of the public would require science of high school students and a slightly larger percentage would require computer science.

Another of the major recommendations of the national commissions and task forces was that either the school day or school year be lengthened to provide more time for instruction. U.S. teachers oppose both of these recommendations by roughly the same margins: 66% oppose lengthening the school year; 72% oppose lengthening the school day. Virtually every major subgroup in the teacher population opposes both of these recommendations.

Sex education. U.S. teachers overwhelmingly support sex education in both the secondary schools and the elementary schools. Almost nine out of 10 teachers (86%) support sex education in high school, and three out of four (75%) support sex education in elementary school.

More specifically, for high school students, large majorities of teachers approve the discussion of such topics as the biology of reproduction, venereal disease, and birth control. Smaller majorities approve of including in high school sex education classes such topics as premarital sex, the nature of sexual intercourse, abortion, and homosexuality. For elementary school students, the only topic that a majority of teachers (70%) feel would be appropriate is the biology of reproduction.

The public supports sex education in the high schools by a smaller margin than teachers do (70% as opposed to 86%). But the public is about evenly divided — 45% for and 48% against — on the question of sex education in the elementary schools.

Control of instruction. Teachers feel that they should have the most influence on what is taught in the public schools. They feel even more strongly that they should have the most influence in the selection of schoolbooks.

By contrast, the public feels that parents and school boards should have the most say about what is taught in the public schools. But the public agrees with teachers that teachers should have the most say about the selection of books and other instructional materials.

Desirability of Teaching as a Profession

As a way of measuring their attitudes about the desirability of teaching as a profession, teachers were first asked whether they would like to have a daughter or a son enter the teaching profession. Teachers are about evenly divided in the case of a daughter's becoming a teacher (43% in favor, 46% opposed) and about 2 to 1 against a son's doing so (31% in favor, 59% opposed).

The question:

> **Would you like to have a daughter of yours take up teaching in the public schools as a career?**
>
> **Would you like to have a son of yours take up teaching in the public schools as a career?**

	Daughter %	Son %
Yes	43	31
No	46	59
No opinion	11	10

Teacher Opinion vs. Public Opinion

Teachers' views on the desirability of teaching as a profession differ somewhat from the attitudes of the public. For example, the public favors a daughter's entering teaching by a ratio of roughly 5 to 4 (50% to 39%). For a son, the public is about evenly divided: 46% say that this would be a good idea, and 42% say that it would be a bad idea.

	All Teachers		U.S. Public	
	Daughter	Son	Daughter (1984)	Son (1984)
	%	%	%	%
Yes	43	31	50	46
No	46	59	39	42
No opinion	11	10	11	12

How Teachers See Themselves

Teachers were asked to rate each of 12 professions on a scale of zero to 10 to indicate their perceptions regarding two factors: 1) the profession's contribution to society and 2) the amount of prestige people in that profession have in their communities.

Not surprisingly, teaching heads the list for contribution to society, with about six teachers in 10 giving their peers a top rating. Next in order are physicians, who receive a 10 from 46% of teachers, and clergy, who receive a 10 from 43% of teachers.

Public school principals are far down the list. Only 19% of teachers give school principals a 10 for their contribution to society. At the bottom of the list are lawyers (6%), funeral directors (5%), business executives (4%), local political officeholders (4%), bankers (3%), realtors (2%), and advertising practitioners (2%).

The prestige that teachers feel they have in their own communities appears to be a sensitive subject. Only 1% of teachers give their profession the highest rating for its status in the community.

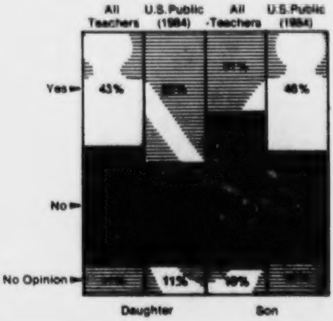
When ratings of societal contribution are compared with ratings of community status, we find that teachers rate three professions — teaching, the clergy, and public school principals — as lower in status than in their contribution to society. The gap for teachers is by far the largest — 59% to 1%.

The question:

> **Now we would like your impressions about different professions and occupations — based on your personal experience or on what you've heard or read. To indicate your impression, please use this scale that goes from the lowest rating of zero to the highest rating of 10.**
>
> **First rate the professions listed below for the amount each contributes to the general good of society. The more you feel it contributes to the good of society, the higher the number you would pick; the less you feel it contributes, the lower the number you would pick.**
>
> **Now rate these professions for the amount of prestige or status you feel people in each profession have in your community.**

	Highest Rating	
	General Good Of Society %	Prestige Or Status %
Public school teachers	59	1
Physicians	46	66
Clergy	43	20
Public school principals	19	3
Judges	13	45
Lawyers	6	32
Funeral directors	5	4
Business executives	4	26
Local political officeholders	4	15
Bankers	3	22
Realtors	2	3
Advertising practitioners	2	4

Is Teaching a Desirable Profession?



Teacher Opinion vs. Public Opinion

The public's feelings about the contribution teachers make to society and about the status of teachers differ somewhat from the views held by teachers. The public feels that teachers contribute substantially less to society than teachers feel they do. Twenty-nine percent of the public would give teachers the highest rating for their contribution to society, compared with 59% of teachers who would give themselves a 10.

On the other hand, the public feels that teachers have more status in the community than teachers feel that they do. Nineteen percent of the public would give teachers the highest rating for status. This figure is far higher than the 1% of teachers who rate their status a 10, but it is still one of the lower ratings that the public gives to any profession. Indeed, teaching is the profession that the public perceives as having the largest disparity between its status in the community and its contribution to society.

	Highest Rating			
	General Good of Society		Prestige or Status	
	All Teachers %	U.S. Public %	All Teachers %	U.S. Public %
Public school teachers	59	29	1	19
Physicians	46	41	66	59
Clergy	43	46	20	42
Public school principals	19	26	3	25
Judges	13	12	45	31
Lawyers	6	12	32	31
Funeral directors	5	20	4	17
Business executives	4	-	26	-
Local political officeholders	4	8	15	18
Bankers	3	14	22	35
Realtors	2	7	3	6
Advertising practitioners	2	4	4	8

Unions, Strikes, and Arbitration

American teachers strongly support teacher unionism, as well as teachers' right to strike over salaries and working conditions. Asked whether they feel that unionization has helped or hurt the quality of public education in the U.S., half of the teacher respondents (49%) say that it has helped; only 18% say that unionization has hurt public education; 26% say that it has made no difference.

Teachers also support their right to strike. Asked whether public school teachers should be permitted to strike, almost two-thirds (63%) feel that they should be permitted to strike; only 26% say that teacher strikes should not be allowed.

Interestingly, teachers favor compulsory arbitration in disputes. Asked if they would favor arbitration if an agreement cannot be reached between a union and a school board, nine out of 10 favor such a plan, and only 3% are opposed.

The question:

Most teachers in the nation now belong to unions or associations that bargain over salaries, working conditions, and the like. Has unionization, in your opinion, helped, hurt, or made no difference in the quality of public education in the U.S.?

	All Teachers	Elementary Teachers	High School Teachers
	%	%	%
Helped	49	48	50
Hurt	18	20	15
No difference	26	25	28
No opinion	7	7	7

The question:

Should public school teachers be permitted to strike or not?

	All Teachers	Elementary Teachers	High School Teachers
	%	%	%
Yes	63	58	70
No	26	30	20
No opinion	11	12	10

The question:

In case an agreement cannot be reached between a teacher union (or association) and the school board, would you favor or oppose a plan that would require the dispute to be settled by the decision of an arbitrator or panel acceptable to both the union and school board?

	All Teachers	Elementary Teachers	High School Teachers
	%	%	%
Favor	90	88	92
Oppose	3	4	2
No opinion	7	8	6

☑ Teacher Opinion vs. Public Opinion ☑

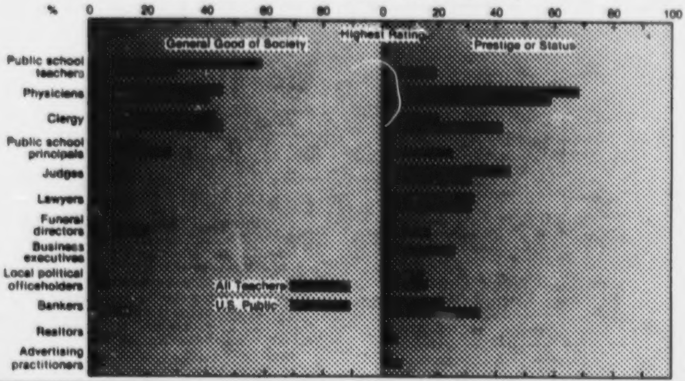
Teacher attitudes regarding the effects of unionization are in almost direct contrast to the attitudes of the general public. Whereas teachers — by a margin of almost 3 to 1 (49% to 18%) — feel that unions have helped the quality of American education, the public — by a margin of 2 to 1 — believes that unionization has hurt education.

Moreover, while teachers feel that they should have the right to strike (63% favor this right), 56% of the public oppose teacher strikes. The public agrees with the views of teachers concerning compulsory arbitration in settling disputes. Large majorities of teachers (90%) and of the public (79%) favor compulsory arbitration.

Effects of Unionization	All Teachers	U.S. Public (1981)
	%	%
Helped education	49	18
Hurt education	18	37
Made no difference	26	33
No opinion	7	12

Teacher Strikes	All Teachers	U.S. Public (1981)
	%	%
Yes, teachers should have the right	63	37
No, they should not	26	56
No opinion	11	7

How Much Do Teachers Contribute to Society?



Require Compulsory Arbitration	All Teachers	U.S. Public (1983)
	%	%
Favor	90	79
Oppose	3	7
No opinion	7	14

The Goals of Education

U.S. teachers were asked to rate the importance of certain goals of education on a scale of zero to 10. Fifty-six percent of teachers gave the highest rating (10) to two goals: developing good work habits, the ability to organize one's thoughts, and the ability to concentrate; and developing the ability to think — creatively, objectively, and analytically. Fifty-five percent of teachers gave a top rating to developing the ability to speak and write correctly; 53%, to developing the ability to use mathematics for everyday problems; and 51%, to encouraging the desire to continue learning as a lifelong process.

The highest percentage of the U.S. public (68%) gives a 10 to developing the ability to speak and write correctly. The second-highest percentage of the public (64%) gives the highest rating to developing standards of what is right and wrong.

The question:

> **Please rate the importance of each of the following possible goals of education on a scale of zero to 10. A zero means a goal is not at all important and should not be part of the public school program. A 10 means a goal is the most important goal — before all others. A rating between zero and 10 means you consider the goal to be somewhere in between in importance.**

	Highest Rating	
	All Teachers	U.S. Public (1984)
	%	%
To help develop good work habits, the ability to organize one's thoughts, the ability to concentrate	56	48
To develop the ability to think — creatively, objectively, analytically	56	51
To develop the ability to speak and write correctly	55	68
To develop the ability to use mathematics for everyday problems	53	54
To encourage the desire to continue learning throughout one's life	51	41
To encourage respect for law and order, for obeying the rules of society	48	52
To develop the ability to live in a complex and changing world	41	51
To prepare those who plan to attend college for college	35	46
To develop skills needed to get jobs for those not planning to attend college	34	54
To develop standards of what is "right and wrong"	33	64
To develop the desire to excel	32	51
To develop an understanding of democracy and to promote participation in the political process	31	33
To develop the ability to get along with different kinds of people	31	42
To develop respect for and understanding of other races, religions, nations, and cultures	30	39
To develop the ability to deal with adult responsibilities and problems, i.e., sex, marriage, parenting, personal finances, alcohol and drug abuse	29	46
To help students make realistic plans for what they will do after high school graduation	27	52
To develop an understanding about different kinds of jobs and careers, including their requirements and rewards	20	56
To gain knowledge and understanding of science and scientific facts	17	45
To gain knowledge of the important facts of history, geography, etc.	15	42
To develop an appreciation for and participation in the arts, music, literature, theater, etc.	14	28
To help students overcome personal problems	13	46
To develop the ability to understand and use computers	12	43
To promote physical development through sports programs	8	30
To help students get good/high-paying jobs	6	46
To develop an appreciation of the "good" things in life	6	32

Subject Requirements

One of the major recommendations of the National Commission on Excellence in Education was that significantly more time in high school be devoted to the traditional basics, English and mathematics, as well as to certain "new" basics, including science, computer science, foreign languages for the college-bound, and vocational training. Virtually all teachers feel that English, math, and science should be required for all students, both those who intend to go to college and those who do not.

However, teachers would distinguish between the college-bound and the non-college-bound in the number of years they would require of a given subject. For example, the average number of years of English that teachers would require for college-bound students is 3.8; the figure for non-college-bound students is 3.6. The figures for math are 3.4 years for the college-bound and 2.7 for the non-college-bound. For science, teachers would require 3.0 years for the college-bound and 2.2 years for the non-college-bound.

The question:

> **If you were the one to decide, which of the following subjects would you require every public high school student who *plans to go on to college* to take?**
>
> **What about those public high school students who do *not plan to go on to college* when they graduate? Which courses would you require them to take?**

	Should Be Required			
	For Those Planning to Go to College	Average Years Required	For Those Not Planning To Go to College	Average Years Required
	%	%	%	%
Mathematics	98	3.4	94	2.7
English	97	3.8	93	3.6
History/U.S. government	95	2.9	81	2.2

	Should Be Required			
	For Those Planning to Go to College	Average Years Required	For Those Not Planning To Go to College	Average Years Required
	%	%	%	%
Science	95	2.8	90	2.4
Foreign language	77	2.1	28	1.4
Physical education	74	2.6	73	2.6
Health education	73	1.5	75	1.6
Business	63	1.5	80	2.1
Art	54	1.3	45	1.3
Music	49	1.3	42	1.3
Industrial arts/ homemaking	46	1.4	78	2.4

Teacher Opinion vs. Public Opinion

The public agrees with teachers about the importance of requiring high school students to take English and mathematics. More than 90% of teachers and of the public would require all students to take these subjects. Similar percentages of the public and of teachers would require high school students to take business, and a somewhat smaller percentage of the public than of teachers would require high school students to take history and science.

For all other subjects, however, a much smaller percentage of the public than of teachers endorses course requirements for either college-bound or non-college-bound students.

	Should Be Required			
	For Those Planning to Go to College		For Those Not Planning to Go to College	
	All Teachers	U.S. Public	All Teachers	U.S. Public
	%	%	%	%
Mathematics	96	96	84	92
English	95	94	93	90
History/U.S. government	95	84	91	71
Science	95	84	90	61
Foreign language	77	57	28	19
Physical education	74	43	73	44
Health education	73	52	75	50
Business	63	66	80	76
Art	54	24	45	18
Music	49	22	42	18
Industrial arts/homemaking	46	37*	78	83*

*The U.S. public was asked about "vocational training."

Extending the School Day or Year

Some of the education reform reports have recommended extending the length of the school day, the length of the school year, or both, in order to provide more time for instruction. U.S. teachers oppose both of these recommendations by roughly the same margins — 72% to 24% in the case of lengthening the school day and 66% to 28% in the case of lengthening the school year.

By contrast, the U.S. public is only marginally opposed to lengthening the school day or school year. The public opposes extending the school day by a margin of 42% to 52%, and the public opposes extending the school year by a margin of 44% to 50%.

The question:

How do you feel about extending the school day by one hour in the school in which you teach? Aside from the question of teacher/staff compensation, do you favor or oppose this idea?

	All Teachers	U.S. Public (1984)
	%	%
Favor	24	42
Oppose	72	52
No opinion	4	6

The question:

In some nations, students attend school as many as 240 days a year, as compared to about 180 days in the U.S. Aside from the question of teacher/staff compensation, how do you feel about extending the public school year in this community by 30 days, making the school year about 210 days or 10 months long? Do you favor or oppose this idea?

	All Teachers	U.S. Public (1984)
	%	%
Favor	28	44
Oppose	66	50
No opinion	6	6

Sex Education

U.S. teachers overwhelmingly support sex education in both public high schools and public elementary schools. Almost nine out of 10 teachers (86%) feel that sex education should be part of the instructional program in the high schools; only 8% oppose the idea. Seventy-five percent of teachers favor including sex education in the elementary schools; only 18% oppose the idea.

However, teachers believe that different sexual topics are appropriate for different levels of schooling. For example, eight out of 10 teachers feel that the following topics should be covered in high school sex education classes: the biology of reproduction, venereal disease, and birth control. Smaller majorities feel that premarital sex, abortion, homosexuality, and the nature of sexual intercourse should be covered in high school classes. Other than the biology of reproduction, much smaller percentages of teachers feel that specific sexual topics should be covered in the elementary schools.

The question:

Do you feel the public high schools should or should not include sex education in their instructional program?

Do you feel the public elementary schools should or should not include sex education in grades 4 through 8?

	In High School	In Elementary School
	%	%
Should	86	75
Should not	8	18
No opinion	6	7

The question:

Which of the following topics, if any, should be included for high school students?

Which of the following topics, if any, should be included for elementary school students?

	In High School			In Elementary School		
	Should %	Should Not %	No Opinion %	Should %	Should Not %	No Opinion %
The biology of reproduction	83	15	2	70	28	2
Venereal disease	83	15	2	40	50	10
Birth control	80	18	2	29	58	13
Premarital sex	68	24	8	21	65	14
The nature of sexual intercourse	62	28	10	24	63	13
Abortion	64	27	9	18	65	17
Homosexuality	55	31	14	15	68	17

☑ Teacher Opinion vs. Public Opinion ☑

Almost as large a percentage of the U.S. public (70%) as of U.S. teachers (86%) supports sex education as part of the high school instructional program. For elementary schools, the public is about evenly divided; 45% favor and 48% oppose sex education in the elementary schools. However, with regard to the specific topics to be included in sex education at both levels, the public is substantially less in favor of instruction in each of these areas.

	In High School		In Elementary School	
Include Sex Education	All Teachers %	U.S. Public %	All Teachers %	U.S. Public %
Should	86	70	75	45
Should not	8	22	18	48
No opinion	6	8	7	7

	Should Be Included in High School		Should Be Included in Elementary School	
	All Teachers %	U.S. Public %	All Teachers %	U.S. Public %
Sex education (in general)	86	70	75	45
The biology of reproduction	83	54	70	37
Venereal disease	83	56	40	23
Birth control	80	55	29	20
Premarital sex	68	42	21	18
The nature of sexual intercourse	62	37	24	16
Abortion	64	38	18	12
Homosexuality	55	32	15	10

Control of Instruction

U.S. teachers feel that they should have the most influence in deciding what is taught in the public schools in their communities. They feel even more strongly that they should have the most influence in the selection of books for classroom use and for school libraries.

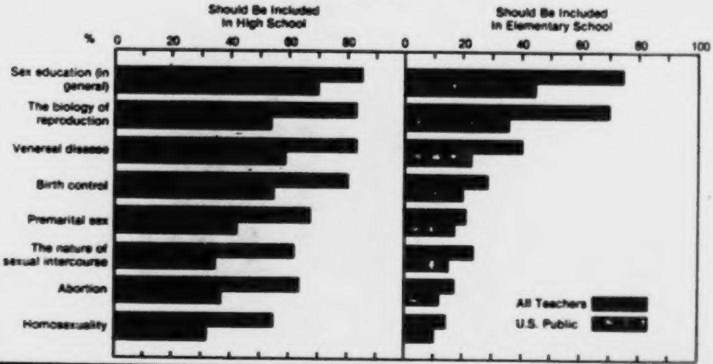
For example, 33% of teachers feel that teachers should have the most influence in deciding what is taught; 19% say the school board, 17% say the state government, and 3% say the federal government. Only 2% say that parents should have the greatest influence in deciding what is taught.

Almost eight in 10 teachers (79%) feel that they should have the most influence in the selection of books for classrooms and school libraries. Only 4% say principals or school administrators, 3% say the school board, and 2% say the parents.

The question:

In your opinion, who should have the greatest

What Topics Should Be Included In Sex Education?



influence in deciding what is taught in the public schools of your community?

	All Teachers %	Elementary Teachers %	High School Teachers %
Teachers	33	31	35
Local school board	18	17	20
State government	17	19	16
Federal government	3	2	3
Parents	2	2	2
No opinion	26	29	24

The question:

Who do you feel should have the most influence in the selection of books for use in public school classrooms and school libraries?

	All Teachers %	Elementary Teachers %	High School Teachers %
Teachers	79	76	82
Principals and school administrators	4	5	2
School board	3	2	3
Parents	*	*	1
No opinion	14	17	12

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*Less than one-half of 1%.

☑ Teacher Opinion vs. Public Opinion ☑

Whereas teachers feel strongly that they should have the most say in determining what is taught in the public schools, the public feels that parents and local school boards should have the most influence in this area. Only 11% of the public agree that teachers should have the most influence; 27% say the school board, and 24% say parents.

In the selection of books for classrooms and school libraries, only 42% of the public feel that teachers should have the most influence. About one in five members of the public (18%) feel that parents should have the most influence in book selection.

	Who Should Decide What Is Taught?	
	All Teachers %	U.S. Public (1984) %
Teachers	33	11
Local school board	18	27
State government	17	17
Federal government	3	8
Parents	2	24
No opinion	26	12

	Who Should Select Books for Classrooms And Libraries?	
	All Teachers %	U.S. Public (1984) %
Teachers	79	42
Principals and school administrators	4	15
School board	3	13
Parents	*	18
No opinion	14	12

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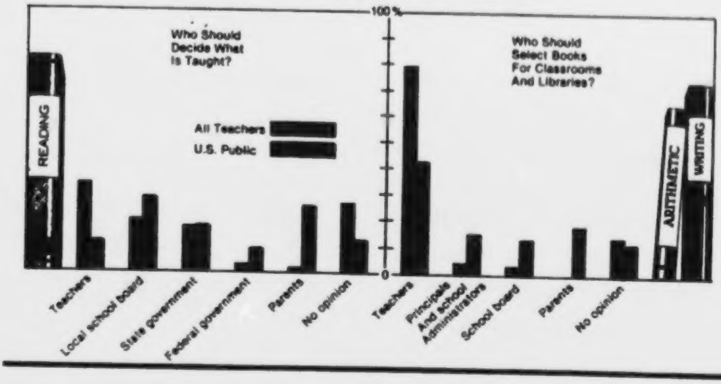
*Less than one-half of 1%.

Ordering This Poll

The *Gallup/Phi Delta Kappa Poll of Teachers' Attitudes Toward The Public Schools* that appeared in the October 1984 issue and in this issue will be available as a separate publication in February. The price is $2 (PDK members $1.50). To order, write: Phi Delta Kappa, P.O. Box 789, Bloomington, IN 47402. Indiana residents add 5% sales tax.

Who Should Decide What Is Taught?



The Impact of State Policy on Entrance into the Teaching Profession

Final Report

NIE Grant No. G83-0073

Submitted to:

National Institute of Education

Education Policy and Organization

by

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CHAPTER 1

STUDY OVERVIEW AND FINDINGS

Introduction

Over the last decade, public confidence in the quality of education has steadily declined. In the late 1970s, dissatisfaction with the performance of the public schools, fueled by evidence of declining test scores and functionally illiterate high school graduates, led 40 states to develop accountability measures and to enact laws requiring students to demonstrate proficiency in the basic skills. More recently, public attention has turned to teachers. Information on the background and preparation of new teachers and "horror stories" about bad teachers in the classroom have led the public to question the quality of America's school teachers and policymakers to search for ways to make the teaching force better.

Evidence of a teacher quality problem abounds. Students entering teacher education programs are less able than those entering other fields; many are drawn from the bottom quarter of graduating high school and college students (National Commission on Excellence in Education, 1983). Mean scores on the Scholastic Aptitude Test (SAT) for future education majors dropped from 867 in 1973 to 813 in 1982. In that latter year, the average score for all students entering college was 893. In fact, students intending to major in education had lower SAT scores than any group of students, with the exception of those intending to concentrate in ethnic studies or in trade and vocational education (NCES, 1982).

While some argue that teaching has never attracted "the best and the brightest," others suggest that the decline in the quality of teachers is indicative of a problem in teacher education. The approximately 50 percent decline in the number of individuals seeking entrance to teacher education between 1972 and 1980 left teacher educators with only two choices: (1) to phase out some of the programs, or (2) to lower standards so as to maintain enrollments (Sykes, 1983). Because of this, many highly selective private colleges and universities have cut back on or are considering terminating their teacher education programs (Travers, 1980). Nonetheless, 100 new teacher education programs were initiated in the last 10 years, primarily in small private colleges with few standards (Feistritzer, 1984).

Teacher preparation programs are criticized for their lack of rigorous standards and their low status on many college and university campuses. Schools of education lack rigorous admission standards and few students fail once they are admitted into teacher training programs. Stoddart, Losk and Benson (1984) state that schools of education admit about 90 percent of their applicants, while Feistritzer (1984) found that more than half of all teacher education programs do not require their students to pass a test upon completion of their training. In addition, the typical teacher preparation curriculum is criticized for including a large number of education methods courses. A survey of 1350 teacher training institutions cited by the National Commission on Excellence in Education found that 41 percent of an elementary school teacher's coursework is in the field of education, limiting the amount of time available for subject matter courses.

Funding patterns supply one index of the low status of teacher education as well as a possible cause for its low quality. Peaseau and Orr (1980) provide data which show that allocations for teacher educa ion, at the bachelor's, master's, and post-master's levels, are substantially lower than for most other curriculum areas. The reputation of schools of education has fallen so low that some critics are recommending that teacher education be provided through alternative routes (Stoddart, Losk and Benson, 1984).

In response to these teacher quality issues, states have initiated a number of policies affecting entrance into the teaching profession. The most common policies are: (1) those that control access into teacher education by the use of basic skills tests, college entrance tests, high school grade point average, or college lower-division grade point average; (2) those that prescribe the nature of training and instruction for individuals who wish to become teachers by specifying curriculum content, number and type of courses, and practicum experiences; and (3) those that control access into the teaching profession by requiring prospective teachers to pass tests in general knowledge, pedagogy, subject matter specialities, or basic skills, and/or by requiring an evaluation of the beginning teacher's classroom performance. In 1983-84, 15 states required teacher candidates to pass a test to be certified and similar requirements will become effective in 8 more states by 1987. By 1985, 9 states will require successful performance in internship programs ranging from one to three years. Admission standards for teacher training institutions are being raised and more liberal arts courses and more fieldwork are being required.

It has been argued that these policies alone are insufficient to increase teacher quality. "They are likely to weed out the obviously unqualified and perhaps marginally improve the quality of first-year instruction" (Sykes, 1983). In addition, there is little or no research supporting the extent to which these screening processes relate to teacher behavior and pupil learning (Shalock, 1979). Indeed, opponents of teacher competency testing argue that it measures only a small part of the requisite skills for teaching and has adverse consequences for minority students.

At the same time that states are moving to control access into the teaching profession, the nation appears to be facing a teacher shortage. Low salaries, low prestige and classroom management and discipline problems are discouraging those who might have been inclined to teach in the past. Industry is attracting math and science-oriented college students, and women and minorities have greater access to other employment because of progress toward equal opportunity goals. The size and composition of the teacher shortage is the subject of much debate. Some studies project a severe, national shortage by the late 1980s (NCES, 1982; Darling-Hammond, 1984). Critics of these studies note that the projections involve several assumptions about turnover rates that may not be valid and that need more careful analysis (Sweet & Jacobsen, 1983). And, they argue, these projections do not include any assumptions about the size and composition of the teacher reserve pool and its potential for meeting increased demand, the actual need and availability of teachers in different academic areas, and the professional and educational backgrounds of teachers holding "emergency" certificates or teaching "out-of-field" (National Academy of Sciences, 1984). Yet, while the quality of the data varies somewhat depending on the source and on the definition of need (primarily whether or not the teacher is certified to teach in the subject area of specialty), there is considerable evidence that a teacher shortage exists and is severe for special education teachers, and for mathematics and science teachers (NEA, 1981; NCES, 1981).

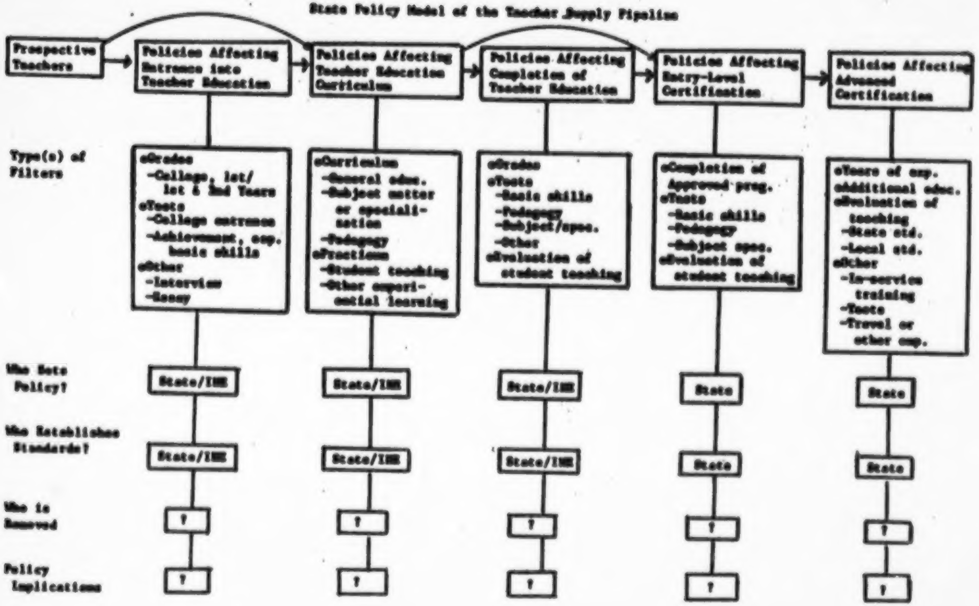
Taken together, these facts raise a critical question. Can this country maintain an adequate supply of teachers while, at the same time, increasing teacher quality?

Focus of the Study

While state policymakers have become active in addressing the problem of teacher quality, little is known about the substance or impact of these activities. The purpose of this study was to describe policies used by states to regulate entrance into the teaching profession and to collect information on the impact of these policies. The first step involved developing a "pipeline" model that identifies the various points at which state policies can control the entry of individuals into the teaching profession and shows the relationships among these points. Next, information was collected through a 50 state survey to identify the points of policy intervention and the types of policies in effect in each state during 1983-84. Third, in-depth case studies were conducted in California, Colorado, Georgia, and Oklahoma to provide important details about the political environment and rationale behind each policy, about the extent of coordination among the policies in each state, and about the impact of the state initiatives on teacher supply and on equity. The case study state selection criteria included the number and type of policies in effect, the date of policy implementation, region of the country, and availability of data on policy impact. Finally, information

Figure 1

State Policy Model of the Teacher Supply Pipeline


Prospective Teachers
Policies Affecting Entrance into Teacher Education
Policies Affecting Teacher Education Curriculum
Policies Affecting Completion of Teacher Education
Policies Affecting Entry-Level Certification
Policies Affecting Advanced Certification
Type(s) of Filters
oGrades
-College, 1st/1st & 2nd Years
oTests
-College entrance
-Achievement, esp. basic skills
oOther
-Interview
-Essay
oCurriculum
-General educ.
-Subject matter or specialization
-Pedagogy
oPracticum
-Student teaching
-Other experiential learning
oGrades
oTests
-Basic skills
-Pedagogy
-Subject/spec.
-Other
oEvaluation of student teaching
oCompletion of Approved prog.
oTests
-Basic skills
-Pedagogy
-Subject spec.
oEvaluation of student teaching
oYears of exp.
oAdditional educ.
oEvaluation of teaching
-State std.
-Local std.
oOther
-In-service training
-Tests
-Travel or other exp.
Who Sets Policy?
State/IHE
State/IHE
State/IHE
State
State
Who Establishes Standards?
State/IHE
State/IHE
State/IHE
State
State
Who is Removed
?
?
?
?
?
Policy Implications
?
?
?
?
?

to differentiate between those policies set by the state and implemented by the IHEs and those policies set and implemented by the IHEs (particularly with regard to minimum grade point average). Finally, states not only use different screening mechanisms for entrance into teacher education but they also set different standards for similar mechanisms.

Prescribed Teacher Education Curriculum

The second filter is completion of a state-prescribed teacher education curriculum. These curriculum requirements affect institutions directly and individuals only indirectly. The state policies usually specify the emphasis and balance within the components of teacher education (general education, pedagogy, and subject matter or specialization) as well as the extent of student teaching and other supervised experiential learning. States must rely on IHEs to monitor the status of individuals completing an approved teacher education program. Unless the individual's course transcript becomes part of a permanent record, it is impossible to differentiate later between the individual who barely meets the requirements of the program and the individual who substantially exceeds the minimum requirements.

There is considerable confusion at this filter point both because no two states have identical curriculum requirements and because requirements vary within states according to teaching level and/or specialty. A few states have recently introduced processes that allow individuals to bypass the prescribed teacher education curriculum.

Completion of Teacher Education

Concerns about the adequacy of the teacher education curriculum filter have led a number of states to institute a third filter that evaluates the individuals who have been exposed to the state-specified curriculum. The major mechanisms here are tests and minimum GPA requirements, although a few states are using competency ratings based on observation of student teaching. The tests used vary considerably. Some states develop their own examinations while others use available standardized tests. Some tests are designed specifically to assess knowledge of teaching methods, some are focused on a subject matter area or specialization, and still others are focused on the basic skills. Even when the same test is used, there is no common standard among states; criteria vary widely and the proportion of individuals passing any test may be highly dependent on the nature and extent of earlier filters. Remediation and retesting are usually available for individuals who initially do not pass test filters.

Confusion at this filter point exists because the same test may be used by an IHE to assess satisfactory completion of teacher education and by a state to evaluate individuals for certification; however, this is not always the case. One must draw a parallel with other professions and be aware that, just as satisfactory completion of medical or law school does not automatically admit individuals to the practice of these professions, neither does satisfactory completion of a teacher education program always automatically provide certification.

Entry-level Certification

Before discussing the policies that affect the teacher certification portion of the pipeline, it is important to differentiate between the types of certification now required. Most states have multi-level certification which consists of entry-level certification for individuals entering the teaching profession for the first time and various mechanisms (such as certification renewal or advanced certification levels) for further screening of teachers. The types of certification can be classified as: (1) one level permanent, (2) one level renewable, (3) multi-level, transition optional, and (4) multi-level, transition required.

The major filters for initial, entry-level certification include education (usually satisfactory completion of an approved teacher education program), tests (sometimes the same tests used at the end of teacher education), and/or observation of student teaching. The teacher certification standards are set and implemented by the state although the extent of state control may be minimal when completion of an approved teacher education program is the only requirement for initial certification. Shortages of teachers in some specialty areas (most often science) have led a small number of states to develop alternative mechanisms for the certification of college graduates who did not complete teacher education programs. This latter certification process usually requires only a few courses in pedagogy and a period of supervised teaching.

Advanced Certification

As indicated above, very few states now issue a permanent (or life-time) certificate. Instead, additional certification steps are required of the experienced teacher. This further certification or re-certification is the fifth and final filter in the teacher supply pipeline. The mechanisms used for the further screening of teachers range from renewal of a single level certificate with only the requirement that the individual has taught for some period in the renewal cycle; to renewals and transitions to higher level certificates based on additional education, in-service training, or other professional development; to renewals and transitions requiring evidence of satisfactory teaching, based on local or state standards evaluated by local or state officials.

The assumption underlying multi-level certificates appears to be that the advanced level of certification indicates greater competency than the entry-level. The picture is complicated by the fact that advancement to a higher level certificate is required in some states and is optional in others. There is no obvious relationship between the type of advanced certification requirements and the required versus optional nature of these requirements.

Study Findings

The findings of this study are grouped into three areas of interest to policymakers: (1) variations in state policies, (2) coordination among state policies, and (3) impact of state policies on teacher supply and equity.

Variations in State Policies

All states require teachers to complete a state-approved training program. The approved program concept is similar to other forms of educational assessment (such as the Carnegie unit) which focus on the types of learning situations to which an individual is exposed and on the time spent in these situations, rather than on what the individual actually learned. The major advantage of using an approved program approach to certify teachers is the speed and ease with which evaluation can be done. The most serious drawback is that, because the course rather than the individual is evaluated, no differentiation is made between individuals whose learning has been outstanding and those who just "squeaked through." In addition, the approved program approach must depend on the course providers to set and maintain standards. Furthermore, no common metric is available to determine if and how much these standards vary across institutions.

These problems of relying on the approved program approach as the sole policy for teacher certification has led an increasing number of states to enact various policies that set standards for evaluating individuals entering the teaching profession. Policies vary along four major dimensions:

- The number of filters in effect,
- The point(s) in the teacher supply pipeline where the filters are placed,
- The content or skills covered by the filter (e.g., basic skills, knowledge of teaching specialty, professional knowledge and/or teaching performance), and
- The minimum standards established.

from both the survey and the case studies was evaluated to develop recommendations for future state policies.

The remainder of this chapter describes how states regulate the training and certification of teachers and summarizes the study's major findings. The second chapter of the report provides profiles describing the specific approaches used in each of the 50 states and reports the results of a survey of policy changes and impact across the states. The third chapter contains the four case studies and describes the case study methodology in greater detail. The final chapter identifies the study's strengths and weaknesses and makes recommendations for additional research.

Teacher Supply Pipeline

The primary policies adopted by states to deal with teacher quality and supply problems have been tests, grade requirements, curriculum prescription, internships and other extensions of preservice training, and on-going teacher education. A pipeline model, that identifies various points where "filters" or "screens" may be installed to control the supply of teachers and describes the types of filters states use, was developed. Figure 1 shows the pipeline model, with five points where state policy can serve as a filter affecting the number and type of individuals who become teachers. The first three filters relate to teacher education and the last two concern teacher certification.

Entrance into Teacher Education

The first filter is entrance into teacher education. The major screening mechanisms here are aimed at individuals, requiring either a minimum grade point average (usually in the first and/or second years of college) or testing (usually a college entrance test or an achievement test, most often focusing on basic skills). Other individual assessment filtering mechanisms, such as personal evaluation and interviews, are less frequently employed. Minimum grade point average (GPA) or test score standards for entrance into teacher education may be established by the state or may be set by the institutions of higher education (IHEs). Implementation is usually carried out by the IHEs. Most states employing a filter at this stage provide individuals who initially do not meet the required test standard a second opportunity for testing after remediation.

This filter presents a confusing picture for three reasons. First, students may enter teacher education programs at different points in their college careers (e.g., when they enter college, or at the end of the second or third year of college). Second, it is often difficult

A survey of all fifty states was undertaken to determine the variations in state policies. This is summarized briefly in this chapter and reported on in more detail in Chapter 2.

A 50-state overview. Table 1 summarizes the types of state policies in effect in 1983-84 (or legislated by 1983-84 but due to become effective after that date). Seventeen states require some or all teacher education candidates to pass a state-prescribed basic skills test before entering a teacher education program, 13 states have established a statewide minimum grade point average, while 10 states require both. All 50 states approve the content of teacher education programs and 38 of them establish minimum course hours in general education, professional studies and subject specialty. To complete a teacher education program, students must maintain a state-established minimum grade point average (20 states) and/or pass a test of basic skills (5 states), a test of professional knowledge (3 states) or a test of knowledge of subject matter (1 state). Six states require a competency-based assessment of the prospective teacher's skills.

The only universal requirement for entry-level certification is completion of an approved program. In 28 states, this is the only requirement for certification. Twenty-two states have established a testing requirement. The type of test used and subject matter tested vary considerably among the states, however. Applicants for certification are tested in basic skills (14 states), general knowledge (9 states), professional knowledge (12 states), and/or knowledge of the teacher's specialty area (14 states). Nine states evaluate a beginning teacher's performance before initial certification is granted.

Only three states--Massachusetts, Missouri and New Jersey--grant a permanent license to first-year teachers but 16 other states provide lifetime certificates to teachers who hold an advanced certificate. The remaining 31 states require teachers to renew their certificates on a regular basis and, with the exception of Illinois, base recertification on years of teaching experience, and/or completion of additional formal education and/or in-service training. Sixteen states require teachers to participate in staff development programs. In most cases, these activities fulfill some recertification requirements.

Policies in four states. In-depth case studies were conducted in California, Colorado, Georgia and Oklahoma to obtain more detailed information on the origins, structure and operation of state policies. The four states selected for these case studies each use some type of individual assessment as well as an approved program approach to screen teachers. The policies they enacted, however, illustrate the wide range of policies used by states across the country. The case study findings are summarized briefly in this chapter and are reported in more detail in Chapter 3.

Colorado requires that students pass basic skills tests in oral and written English communication skills and in mathematics before formal admission into an approved teacher education program or assignment to student teaching. A norm-referenced test, the California Achievement

Table 1 (cont.)

Summary of State Policies Affecting the Entrance
of Individuals into the Teaching Profession

	Entrance into Teacher Education			Teacher Education Curriculum	
State	Test	Minimum Grade Point Average	Other	Approved Program	Distribution Requirements
Oklahoma		X		X	X
Oregon	X	X		X	
Pennsylvania				X	
Rhode Island				X	X
South Carolina	X			X	X
South Dakota				X	X
Tennessee	X			X	X
Texas	X[j]			X	X
Utah				X	X
Vermont				X	
Virginia				X	X
Washington				X	
West Virginia				X	X
Wisconsin				X	X
Wyoming	X			X	X

Completion of Teacher Education Program

State	Minimum Grade Point Average	Test Basic Skills	 Prof. Knowl.	 Subject Special.	Other
Alabama	X				
Alaska					
Arizona	X	X	X		
Arkansas	X				
California					
Colorado	X				
Connecticut	X				
Delaware					
Florida	X				
Georgia	X	X^g			
Hawaii	X				
Idaho	X				
Illinois					
Indiana					
Iowa					
Kansas	X				
Kentucky	X				
Louisiana	X				
Maine					
Maryland					
Massachusetts					X^h
Michigan					
Minnesota					
Mississippi	X				X^h
Missouri	X				
Montana	X				
Nebraska					
Nevada					
New Hampshire					
New Jersey	X				
New Mexico					
New York					
North Carolina		X			
North Dakota	X				
Ohio					

Completion of Teacher Education Program

State	Minimum Grade Point Average	Test Basic Skills	Test Prof. Knowl.	Test Subject Special.	Other
Oklahoma	X				
Oregon					
Pennsylvania					X[h]
Rhode Island					
South Carolina					X[h]
South Dakota	X				
Tennessee	X	X			
Texas					
Utah					
Vermont					
Virginia					
Washington					X[h]
West Virginia		X[b]	X[b]		X[b,h]
Wisconsin					
Wyoming					

Entry-Level Certification

State	Approved Program	Test: Basic Skills	Test: General Knowl.	Test: Prof. Knowl.	Test: Subject Special.	Evaluation of Beginning Teaching
Alabama	X			X	X	
Alaska	X					
Arizona	X					X[b]
Arkansas	X	X	X	X	X	
California	X	X				
Colorado	X					
Connecticut	X					
Delaware	X	X				
Florida	X	X		X		X
Georgia	X				X	X
Hawaii	X					
Idaho	X					
Illinois	X					
Indiana	X					
Iowa	X					
Kansas	X		some type of test[k]			
Kentucky	X	X[j]	X[j]	X[j]	X[j]	
Louisiana	X	X	X	X	X	
Maine	X					
Maryland	X					
Massachusetts	X					X[b]
Michigan	X					
Minnesota	X					
Mississippi	X	X	X	X	X	X
Missouri	X				X[b]	
Montana	X					
Nebraska	X	X[j]			X[j]	
Nevada	X					
New Hampshire	X	X[a]				
New Jersey	X					
New Mexico	X	X	X	X	X	
New York	X	X	X[j]	X[j]		
North Carolina	X			X	X	X[j]
North Dakota	X					
Ohio	X					

Entry-Level Certification (cont.)

State	Approved Program	Test Basic Skills	General Knowl.	Prof. Knowl.	Subject Special.	Evaluation of Beginning Teaching
Oklahoma	X				X	X
Oregon	X					
Pennsylvania	X	Some type of test[1]				
Rhode Island	X					
South Carolina	X				X	X
South Dakota	X					
Tennessee	X	X	X	X	X	
Texas	X	Some type of test[2]				
Utah	X					
Vermont	X					
Virginia	X	X[3]	X[3]	X[3]	X[3]	X[3]
Washington	X					
West Virginia	X					
Wisconsin	X					
Wyoming	X					

State	Recertification					State Requires Staff Development
	Years of Experience	Add'l. Formal Education	In-Service	Other	Lifetime, Not Appl.	
Alabama	X^a	X^a				
Alaska	X	X				
Arizona	X	X^b				
Arkansas	X^a	X^a			X^c	
California	X	X	X^b			X^b
Colorado	X	X^a	X^d	X^a		
Connecticut	X	X^a	X^a		X^c	X^b
Delaware	X				X^c	
Florida	X	X^a	X^a			X
Georgia	X	X^a	X^a			
Hawaii	X				X^c	
Idaho	X	X	X^d			X
Illinois				X^f		
Indiana	X	X			X^c	
Iowa	X	X	X^d		X^c	
Kansas	X	X	X^d			
Kentucky	X	X	X^d		X^c	
Louisiana	X	X^a		$X^{a,g}$	X^c	
Maine	X	X^a	X^a			
Maryland	X	X^a	X^a		X^c	
Massachusetts					X	
Michigan	X	X^a	X^a		X^c	
Minnesota	X	X^a	X^a	X^a		
Mississippi	X	X	X^d			
Missouri					X	
Montana	X	X^a	X^a			X
Nebraska	X	X				
Nevada	X	X^a	X^a			
New Hampshire	X		X			X
New Jersey					X	
New Mexico	X	X	X^d			X
New York	X	X			X^c	
North Carolina	X		X^d			
North Dakota	X	X				
Ohio	X	X			X^c	

State	Recertification (cont.) Years of Experience	Add'l. Formal Education	In-Service	Other	Lifetime, Not Appl.	State Requires Staff Development
Oklahoma	X[a]	X[a]				X
Oregon	X	X				
Pennsylvania	X	X[a]	X[a]		X[c]	X
Rhode Island	X	X			X[c]	
South Carolina	X	X[a]	X[a]			
South Dakota	X	X[a]	X[a]			X[b]
Tennessee	X	X				X
Texas	X[a]	X[a]			X[c,k]	X
Utah	X[a]	X[a]	X[a]			
Vermont	X	X[a]	X[a]			
Virginia	X	X[a]	X[a]			X
Washington	X	X				
West Virginia	X	X			X[c]	X
Wisconsin	X	X[a]	X[a]			X
Wyoming	X	X[a]	X[a]			

[a] May be substituted for another requirement.

[b] Effective 1985.

[c] Applies to holders of Advanced Certification.

[d] May substitute for some formal education credits.

[e] Required in state-supported schools only.

[f] Payment of fees and registration.

[g] Request of employing superintendent.

[h] Competency-based assessment.

[i] Required for entrance into student teaching.

[j] Effective 1984.

[k] Effective 1986.

[l] Effective 1987.

[m] No date set for implementation.

Test (CAT), is used to assess written English and mathematics skills. The passing score is the 75th percentile score for high school seniors nationally. Students who fail any section of the test may be retested three additional times.

California also uses a single assessment with a basic skills test. The California Basic Educational Skills Test (CBEST) is designed to measure college-level skills in reading comprehension, English composition and mathematics. The original legislation required all applicants for teaching credentials (except those in adult education or in a children's center) to pass this test. A 1983 amendment requires that the test be taken, but not passed, before admission to teacher education. To pass, an examinee must have a total score of 123, with a minimum score of 37 on each of the three test sections. The cutoff scores set by the Superintendent of Public Instruction at a level slightly higher than those recommended by an advisory board, were based on a predetermined proportion of items to be passed in each test section, ranging from 65 percent to 70 percent. Individuals may repeat any sections of the test they fail with no limit on the number of retestings.

Georgia conducts two assessments of individuals entering the teaching profession. All applicants for initial certification must pass the Georgia Teacher Certification Test (TCT) in the area of their teaching specialty. The TCT is composed of 23 criterion-referenced area tests. Individuals who fail this test may teach for one year on a probationary license. The test may be retaken any number of times. During the initial three years of teaching, candidates for renewable certification must demonstrate acceptable teaching performance as measured by the Teaching Performance Assessment Instruments (TPAI). This instrument, which assesses 14 generic competencies evaluated by 45 indicators, is composed of five sections: (1) teaching plans and materials, (2) classroom procedures, (3) interpersonal skills, (4) professional standards, and (5) student perceptions. Candidates are assessed up to six times over a three year period. The assessors are a supervisor, a peer teacher, and an external data collector. Candidates must attain 85 percent of the competencies on the first assessment or 75 percent on two or more assessments to pass.

Oklahoma also conducts two assessments. Individuals applying for an entry-year license take a criterion-referenced test of knowledge in the teaching specialty area, called the Oklahoma Teacher Certification Testing Program (TCT). This consists of 76 tests covering 34 content areas. Cutoff scores were set as part of the test development process, based on estimates by current teachers and teacher educators of the proportion of successful beginning teachers who could pass each item. Individuals who fail the test may retake it as often as they wish. Individuals with an entry-year license must take part in the Entry-Year Assistance (EYA) program. The beginning teacher is observed and evaluated at three times during the first year of teaching using an instrument that covers human relations, teaching and assessment, classroom management and professionalism. The evaluators are a teacher consultant, an administrator, and a teacher educator. At the end of the first year the evaluators may recommend certification or may recommend that the teacher take part in the EYA program for a second year. If teachers are not recommended for certification after the second year, they cannot continue teaching.

A number of factors influenced the design of assessment policies in these four states. One can look first at the impetus behind the policy. Georgia policymakers were swept up in the competency education movement of the early 1970s. In response to legislative interest in competency-based certification, a statewide task force produced a plan to implement competency-based preparation and certification in Georgia by 1978. Oklahoma policymakers apparently looked to Georgia for a model program. Basic skills testing was enacted in Colorado and California because, in each state, a determined legislator responded to anecdotal evidence of a crisis in teaching.

A second factor is contextual. In 1977, the Colorado State Board of education required IHEs to screen prospective teacher education candidates for basic skills competencies, but left the choice of an assessment instrument to the IHEs. The legislation requiring use of the CAT went one step further by imposing a uniform measure across all institutions. The sponsor of the CBEST legislation in California had authored legislation in 1977 that mandated statewide pupil proficiency testing. Basic skills testing of teachers seemed to him to be a logical extension of this earlier legislation.

A third factor is the availability of funds to develop and implement assessment instruments. For example, both Colorado and California legislated the use of basic skills tests as screens. When the Colorado legislature did not appropriate money for test development, policymakers were limited to existing instruments and looked primarily at those already used by IHEs to screen applicants. In California, funds were available to support the development of a new test when it was determined that commercial tests did not satisfy the objectives set by the advisory committee. Georgia and Oklahoma also had sufficient resources to undertake a lengthy test development process.

A final factor is politics. Responsibility for formulating and administering teacher education and certification policies is shared by state legislatures, state boards of education, state departments of education and other state agencies, and institutions of higher education. In most cases, the legislatures specify the area(s) to be assessed (e.g., basic skills competencies in mathematics, communications, etc.; teaching specialty; and/or teaching performance) and the point(s) in the pipeline where the assessments will be made (e.g., admission into teacher education, admission into student teaching, completion of the program, etc.). The State Board of Education is then given the authority to select an assessment instrument, set minimum standards (such as test cut-off scores) and develop assessment procedures.

The Georgia legislature gave the State Board of Education total responsibility for designing a competency-based teacher assessment program. All negotiations and compromises were made outside the legislative chambers. Oklahoma's legislation, which is somewhat prescriptive, was subject to 100 amendments; 35 were accepted. California's Senator Hart first proposed that CBEST be used to screen applicants to teacher education programs. This proposal was opposed successfully by IHEs that felt such a policy would encroach on their right to set admissions policies. As a result, the test became a requirement for certification. Politics also affected standard-setting. Although, California used sophisticated methods to establish cutoff scores, the Superintendent of Public Instruction raised the cutoff score a few points above that recommended by the advisory committee because he was personally committed to raising educational standards.

One generalization can be made across the four states. Although they differ in approach, the new state policies are here to stay. Regardless of low passage rates by minorities or by graduates of some IHEs, legislators are in no mood to lower standards. They feel that public response has been favorable and that there is more support for raising standards at other points in the pipeline than for modifying existing policies.

Trends in state policies. The mix of policies now in effect across the nation results from changes made by the states in an attempt to enhance the quality of the teaching profession. As part of the 50-state survey, states were asked to specify which policies had been changed in the last five years. The results are summarized in Table 2.

Thirty-seven states indicated that they had made some type of policy change in the preceding five years. Although only one state made changes in all five areas, the majority of states instituted changes in several areas. Only eight states reported policy changes in a single area. Thirty-two states reported changes in the areas of teacher certification and 28 reported changes in the teacher education curriculum. Twenty states changed policies affecting entrance into teacher education, 15 changed requirements affecting completion of teacher education, and nine reported changes affecting staff development.

State respondents were also asked whether policy changes had affected the quality and/or supply of teachers. The results, which are reported in detail in Tables 3-6 in Chapter 2, suggest that changes made in certification policies impact primarily on teacher quality, while changes made to policies at earlier points in the teacher preparation process are likely to affect teacher supply as well as quality. However, much of this impact assessment is based on impressions, rather than on analysis of data. Few states indicated that they had collected data to help them identify the impact of policies affecting entrance into the teaching profession.

Table 2

Types of Recent State Policy Changes
Affecting Teacher Education and Certification

State*	Entrance Into Teacher Education	Teacher Education Curriculum	Completion of Teacher Education	Teacher Certification	Staff Development
	Policy Areas				
AL				X	
CA	X	X		X	
CO	X	X		X	
CT	X	X	X		X
DE				X	
FL	X	X	X	X	
GA		X		X	
HI	X	X		X	X
ID		X		X	X
IL		X		X	
IN		X		X	
KS	X	X	X	X	
LA	X	X	X	X	X
MA	X	X	X	X	
MI		X			
MN	X	X		X	
MO	X	X	X	X	
MS	X	X	X	X	
MT		X		X	X
NE		X		X	
NH		X			
NJ	X	X	X		
NM	X		X	X	
NV		X	X	X	X
NY				X	
NC	X	X	X	X	
OH		X			
OK	X		X	X	X
OR	X	X		X	
SC	X	X	X	X	
TN	X	X		X	
TX	X		X	X	X
UT	X			X	X
VT				X	
VA		X	X	X	
WI		X		X	
WY				X	

*Only states which responded to the questionnaire and which indicated they had made policy changes within the preceding five years are included.

Coordination Among State Policies

There are a number of junctures in the teacher preparation and licensing process at which states currently impose requirements. There is little evidence, however, that in most states these requirements are developed as a part of a comprehensive set of state policies affecting entrance into teaching (Peterson, 1984). Legislators often enact policies in a piecemeal fashion, making isolated responses to isolated problems rather than taking a broader view and providing a set of coordinated procedures. Georgia and Oklahoma provide examples of states which have tried to produce a coordinated set of processes which link teacher performance to teacher education. Yet, they share two types of coordination problems with the other case study states.

First, accountability for student failure is often misplaced. Although instruction in basic skills and subject matter areas is usually not provided in the schools of education, basic skills and subject matter specialty tests are used to evaluate the teacher education programs. Teacher education departments are held responsible for education students' knowledge of these areas while non-education departments actually providing the instruction have little or no incentive to improve their teaching in ways that will improve teacher quality. This problem is aggravated in states like Georgia where schools of education may be placed on probation, and ultimately closed, if their graduates perform poorly on subject matter tests.

The second coordination problem centers on the provision of remediation to individuals who do not initially pass the tests. Although most of the case study states recommended such remediation, it is required only in Colorado. None of the four states provide funds for remediation. In addition, the nature of tests used often makes remediation difficult. CBEST and CAT are norm-referenced tests. Thus, institutions cannot identify specific deficiencies within each basic skill subtest area. Moreover, in California, students can decide whether or not to have the CBEST score reported to their institutions. Without this information, institutions may have no indication that individuals need remedial assistance. In both Georgia and Oklahoma, although the subject matter tests are criterion-referenced, limited individual information is available to IHEs. The primary data provided to IHEs to assist in remediation are objective mastery reports which provide a list of objectives with low pass rates across the state.

There also appears to be no coordination between the tests used by the states in other parts of higher education (e.g., for admission, or for promotion to junior standing) and those used in teacher education. For example, the California State University system cannot compare the performance of entering freshmen on its communications skills and mathematics entrance tests and their performance on CBEST one to two years later. And there is considerable institutional variation in the extent to which teacher education programs can and do make use of the remedial services available on their campuses for students who fail these other tests.

Impact of State Policies on Teacher Supply and Equity

The states which have introduced new policies in the last five years perceive them as strengthening teacher education programs, making students more serious about teacher education, focusing attention on weaknesses in the teacher education curriculum, and screening out students who lack sufficient knowledge of basic skills, subject matter and/or pedagogy. A major activity of this study was to identify, collect and analyze data on the characteristics of individuals screened out of the teaching profession and on the impact of state policies on teacher supply.

Who is screened out of teaching? Although the impact of individual assessment policies differed somewhat across the four case study states, several patterns were evident.

First, it appears that more people are screened out by basic skill testing and by testing early in the teacher preparation process than by later subject matter testing or evaluation of beginning teachers. In Colorado, the pass rate for the CAT, which is required for entrance into teacher education, hovers around 65 percent. The initial pass rate on CBEST, which is required for certification in California, is 68 percent. In Georgia, 78 percent of first time test-takers pass the TCT, which is required for initial certification, while fewer than one percent of beginning teachers who complete three years of teaching are screened out by the TPAI. However, about 25 percent of beginning teachers leave the classroom before the end of three years either because of sub-standard performance on the TPAI or because they decide they do not wish to pursue a career in teaching. In Oklahoma, about 80 percent of first time examinees pass the TCT, and 98 percent of beginning teachers are recommended for certification after first year evaluation in the EYA program.

Second, the passage rates differ considerably by racial/ethnic group. In California, 76 percent of white test-takers, 39 percent of Hispanic test-takers, and 26 percent of Black test-takers pass CBEST. In Georgia, 87 percent of White students pass TCT on the first attempt but only 34 percent of Black students do so. In Oklahoma, the TCT pass rate for Whites is 79 percent, for Hispanics 58 percent, and 48 percent for Blacks. Colorado does not collect data by race/ethnicity.

Finally, the individual assessments have a differential impact on students from different types of IHEs. The CBEST pass rates at California IHEs ranged from a low of 33 percent to a high of 90 percent. Up to 85 percent of the students at more selective institutions but only 30 to 40 percent of students at open admissions institutions in Colorado pass the CAT. Similar institutional differences exist in Georgia and in Oklahoma. It seems clear that the more selective the general admission policies of the IHEs are, the higher the pass rates will be on later assessments.

Many institutions with high failure rates have responded by raising the admission standards for their teacher education programs. Several California State University campuses now require students to pass CBEST before admission to teacher education, while other campuses have also raised the minimum GPA requirements. In Colorado, students at some open admissions institutions must now pass the CAT before acceptance into a teacher education program. These types of action, of course, reduce the amount of time which inadequately prepared students have to overcome their deficiencies. The case study data suggest that this group includes older students returning to education with "rusty" skills, especially in mathematics, and students from disadvantaged backgrounds and/or with inadequate secondary school education.

Teacher shortages. There is a general perception among the respondents in our case study states that the use of individual assessment will aggravate teacher shortages. However, it is difficult to isolate the impact of state policies from other factors which have also affected the supply of beginning teachers: changing demographics, low salaries and expanding employment opportunities for women and minorities. We found that few states or IHEs collect the type of data needed to accurately assess the impact of changing state policies on teacher supply and demand. None of the states we visited had information on the number of unfilled teaching positions by program areas or by type of community. This situation is not uncommon; in 1982, only 11 states had automated teacher supply/demand models (National Academy of Sciences, 1984).

Available data on individuals screened out of the teaching profession suggest, however, that state policies will aggravate shortages of certain types of teachers. A shortage of minority teachers is evident from the data cited above. Statistics collected by other states using teacher testing programs show that their tests have also had a differential impact on majority and minority populations. In Florida, 83 percent of those who took the state's teacher certification examination in 1982 passed each of its four parts. Among Blacks the figure was 35 percent. When prospective teachers took a competency test required for admission to colleges of education in Texas, 62 percent of the Whites passed all three sections of the test compared to 10 percent of the Black and 19 percent of the Hispanic test-takers. These figures have led one educator to predict that "within the decade, the minority teaching forces will be less than 5 percent, compared to 12 percent in 1980." A related consequence will be a growing shortage of teachers for bilingual education programs.

Teacher shortages in certain types of school districts may also be increased by some of these assessment policies. In California, severe teacher shortages in inner city schools were reported and cited as one reason for the introduction of a program to provide alternative routes for entering the teaching profession. In all four case study states, increasing certification requirements were viewed as creating teacher supply problems in rural school districts, where the pool of available individuals is small. In Oklahoma, especially, where there are pressures to certify individuals in their major subject area only, considerable opposition has been expressed by rural superintendents who often need individuals who are certified to teach a variety of subjects.

Finally, policymakers in Georgia and Oklahoma, which use teaching specialty knowledge tests, expressed concern about the different pass rates in various subject matter areas. In Oklahoma, for example, pass rates have been somewhat lower in teacher shortages areas, such as mathematics and science (trigonometry, 78 percent; earth sciences, 22 percent; physics, 44 percent) and foreign languages (French, 21 percent; German, 57 percent) than in areas where the teacher supply is greater.

Policy Implications and Recommendations

It is necessary to have screens in the teacher supply pipeline to ensure the quality of individuals entering the teaching profession. It appears that, as a method, assessment of individual teachers provides a better way of evaluating the capabilities of potential teachers than does program approval. However, the findings from this study lead us to conclude that the approaches used by most states today are inadequate to address the problems of equity, coordination and accountability.

Equity

Current state policies focus on screening out people, rather than on developing the talents of individuals who wish to become teachers. This emphasis impacts adversely on: (1) students entering college with weak secondary school preparation, (2) adults returning to college or making a career change, and (3) open-admissions institutions and their students. Current policies which restrict access into the teaching profession will reduce the socio-economic and racial/ethnic diversity of the nation's teaching force at a time when the schools are educating larger numbers of minority students.

When students are screened prior to entrance into teacher education, IHEs have little opportunity to provide instruction to compensate for students' past educational inadequacies. With the help of a well-designed remediation program, many of the students now excluded could become satisfactory teachers, in terms of both subject matter knowledge and teaching performance.

There is also a conflict between states' policies for open admission to higher education and policies restricting admission to teacher education. Open-admissions colleges tend to attract more students from disadvantaged backgrounds or with inadequate high school preparation. High failure rates on certification tests, however, have led several states to consider closing or placing on probation, teacher education programs at these types of institutions. This can result in teacher education programs being available only in institutions which have selective admissions policies and in the abolishment of teacher education in institutions with open admissions policies.

In addition, state policies are acting as a damper on students' interest in a teaching career. The testing requirements are often seen as a hurdle and one that is not required for entrance into other occupations. The mandated publication of test results and the extensive publicity about racial/ethnic differences in the pass rates on tests for prospective teachers appears to have led many minority students to assume, whether correctly or not, that they too will be unable to pass these tests. This has, consequently, led these students to choose other careers.

The end result of current state policies will be to reduce the social and economic heterogeneity of the nation's teaching force. In 1980, 87 percent of public elementary and secondary school teachers were White, 10 percent were Black and 2 percent were Hispanic. At the same time, 16 percent of the school children were Black, 8 percent were Hispanic and 3 percent were from other minority groups. The racial/ethnic mismatch of teachers and children varies across the states. Student bodies in the southern states are 30 to 50 percent minority; the teaching force is 20 to 40 percent minority. Forty-three percent of California students are non-White, while only 16 percent of their teachers are non-White. In New York and Arizona, the percentage of minority students is 3 to 4 times greater than the percentage of minority staff (Dilworth, 1984). Yet, it is those states with large minority student enrollments--in the South, California, New York, New Mexico, Texas and Arizona--that have implemented programs to screen teachers. The poor performance of minorities on these tests, the closing of teacher education programs in open-admissions and predominantely minority institutions, and the declining number of minorities entering college and aspiring to be teachers will worsen the socio-economic and racial/ethnic mismatch between student and teacher in the next twenty years.

Recommendations. To ensure that all students who aspire to be teachers have an opportunity to prepare for a teaching career, state policies on teacher preparation should include the following elements:

- o All students entering college should be assessed to identify basic skill deficiencies and opportunities for remediation should be provided, if necessary.
- o A student should show proficiency in basic skills before admission to a teacher education program. This policy should also apply to other college majors, not just teacher education. The mechanism used to screen teacher candidates for basic skills proficiency should be the same as that used to assess entering freshmen.

- Students' knowledge of both subject matter specialty and pedagogy should be evaluated before a teacher education degree is awarded, using a common metric across IHEs within a state.

- Screening devices should be designed in a way that provides diagnostic information for student remediation and for program improvement.

- States should provide adequate resources for remediation and program improvement.

Coordination

Many states focus on assessing a limited number of skills which have varying degrees of relevance to the teacher education curriculum and, ultimately, to classroom performance. For example, 14 states require basic skills tests for certification and nine require tests of general knowledge but only nine evaluate a beginning teacher's classroom performance before certification is granted.

State policies also result in misplaced accountability with teacher education departments held responsible for students' knowledge of the basic skills and of subject matter area. Consequently, non-education departments have little or no incentive to improve their teaching in ways that will improve teacher quality. This situation is aggravated by state policies that use test score results in basic skills and subject matter areas to place teacher education programs on probation.

Recommendations. Coordination between teacher education curriculum and certification standards can be achieved by:

- Requiring candidates for certification to show evidence of proficiency in basic skills, subject matter area and professional knowledge and to complete a successful entry-year teaching assignment.

- Informing non-education departments of deficiencies in student performance on subject matter examinations and teacher education departments of deficiencies in professional knowledge and first year teaching performance.

- Applying probationary policies specifically to those departments that provide the relevant subject matter and teacher education courses.

Accountability

State policies are short-sighted because no attention is given to the impact of policies on teacher supply at a time when growing teacher shortages are projected. Few states collect data on either the impact of their teacher screens or the supply and demand for teachers by teaching specialty and geographic region. This means that policymakers cannot determine who is being closed out of the teaching profession by state policies, at what point in their education students are being screened out, and what kind of alternative programs should be developed when the impact of policies is undesirable.

Recommendations

- State agencies should collect data necessary to determine the impact of state policies on teacher supply, paying particular attention to shortages of minority teachers, in specific subject matter areas and in geographic regions.
- Whenever major policy changes are made, states should examine who is being screened out and why.
- States should develop facilitating opportunities to overcome undesirable impacts of their policies. These opportunities could include remedial programs, recruitment of minority students into teacher preparation programs, early career exploration, forgiveable loans, and incentive policies directed toward better pay and working conditions.

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SOLVING THE SHORTAGE OF MATHEMATICS AND SCIENCE TEACHERS

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Abstract

Present shortages of mathematics and science teachers in secondary schools are not a new phenomenon. Such shortages have been present for at least 40 years, with only the magnitude of the shortages fluctuating. Nor is the cause of the shortages a new phenomenon. Just as school salary policy, with its reliance on the single salary schedule, has not provided competitive salaries for mathematics and science specialists in the past, that practice continues to create a shortfall in the number of qualified mathematics and science personnel willing to take teacher-training and offer their services to schools. It is only by providing special increments to attract mathematics and science specialists that a long-term solution can be effected. Schools can accommodate such a change in policy through careful and systematic planning. Both the state and federal governments have roles to play in assisting schools to provide salary policies that will attract adequate numbers of qualified teachers for all openings.

INTRODUCTION

Among all of the challenges facing American education, one of the most serious is the dearth of science and mathematics teachers at the secondary level. Although the severity of the shortage is not clear from existing data (Rumberger 1984), the fact of the shortage and its implications are. In some states, it is believed that the majority of new science and mathematics teachers at the secondary level lack sufficient training in the subject areas that they teach (Shymansky and Aldridge 1982). And the situation seems to be getting worse. Not only are insufficient numbers of college graduates with mathematics and science backgrounds applying for available teaching openings, but experienced teachers are leaving the schools to take more lucrative jobs in industry.

A large number of responses have been suggested. These include job sharing by trained teachers who seek only part-time employment, greater use of educational technologies to replace teachers, the lending of qualified persons by industry and the military on a year-to-year basis, appropriate retraining of teachers from other specializations to provide instruction in science and mathematics, and the provision of incentives such as grants or "forgivable" loans to undergraduates who major in the sciences or mathematics and enter teaching.

The urgency attached to the present situation has emanated primarily from national calls for educational reform (National Commission on Educational Excellence 1983; National Science Board Commission on Precollege Education in Mathematics, Science, and Technology 1983; Task Force on Education for Economic Growth 1983). These reports suggest that the U.S. will not be able to compete in an increasingly competitive world economy based upon high technology without stronger training in mathematics and the sciences. Accordingly, they call for an increase in mathematics and science requirements for secondary school graduation, and many of the state legislatures have already enacted such changes (U.S. Department of Education 1984). Also, the shortage of science and mathematics teachers is particularly exacerbated at the present time by the strong job opportunities for science and mathematics specialists in industry.

Because of the sudden attention given to the shortage of mathematics and science teachers, it may appear that the issue is a recent phenomenon. Quite to the contrary, the evidence provided in this paper suggests that shortages of such teachers have existed for at least the last 40 years and that the present crisis is only a more extreme manifestation of a situation that has its origins in the single salary schedule employed by the schools. The single salary approach provides the same salary to all teachers within a school district with the same degree level and length of service without differentiating salaries according to the field of specialization. Yet, college graduates face vastly different job opportunities according to their fields of training so that the same salary level in teaching will be less attractive to those with better salary alternatives outside of teaching. The failure of a single salary schedule to attract college graduates who are able to find considerably more lucrative employment in business and industry will lead to shortages in those specialities. In this paper we will review the historical evidence on shortages and their relation to the single salary schedule as well as suggest how to use salary policy to alleviate such shortages. We will also examine the likely success of those alternative policies that are presently directed at the elimination of shortages of science and mathematics teachers.

II- FORTY YEARS OF SHORTAGES

What is somewhat surprising about the recent clamor over the shortage of mathematics and science teachers as well as the prosaic nature of the proposed solutions is the failure to see such shortages and solutions in historical perspective. Shortages of teachers generally, and those of science and mathematics specialists particularly, were severe in the 1950s as a result of the tremendous expansion of school enrollments resulting from the baby boom. (It should be noted that although we will refer to shortages of science and mathematics teachers, we are referring primarily to teachers in the areas of physics, chemistry, mathematics, and--more recently--statistics and computer science. In the past, it appears that biology teachers have generally been far more available to schools than other science specialists (Kershaw and McKean 1962: Chap. 6). But the problem was not widely acknowledged until the Sputnik scare of 1958, just as the more recent concern for expanding high technology has focussed attention on it at the present time.

Before proceeding, it is important to establish a definition of what is meant by shortage and of qualifications (Rumberger 1984). In this analysis, shortage will refer to the situation in which an inadequate number of teachers with appropriate qualifications offer their services to the schools at prevailing salaries and working conditions relative to the openings in schools for such teachers. With respect to qualifications, it should be noted that each state uses different criteria. In some states, a few courses in each of a number of the sciences enable a person to be certified to teach any science. However, in this paper, we will assume that the minimum qualification for teaching a particular subject such as chemistry, mathematics, or physics is an undergraduate college major in that subject. The assumption is that if this is a minimum criterion for professional work in these areas in industry, we should hardly expect secondary school instructors to teach with lower qualifications.

What does the evidence suggest for the past several decades? In what is still the classic work on the subject, *Teacher Shortages and Salary Schedules* , Joseph Kershaw and Roland McKean (1962: Chap. 6) attempted to evaluate the extent of teacher shortages in the 1940s and 1950s. Among the data that they reported are the following: Sixty percent of secondary school mathematics classes in Colorado in 1946-47 were taught by persons with neither a college major nor a minor in mathematics. The average high school physics teacher in Wisconsin in the late 1950s had only 13.5 semester hours of college-level physics, and 7 percent had no college physics course. A survey taken in the same period for the three states of Maryland, New Jersey, and Virginia found that 7 percent of mathematics teachers had never taken a college course in the subject and 40 percent had not taken even a basic course in calculus.

In the spring of 1958 over 40 percent of mathematics teachers in Los Angeles lacked a college major or minor in mathematics, and 7 percent had not taken any college mathematics course. For the state of California in 1956-57, 35 percent of mathematics teachers in junior and senior high schools had not taken a college major or minor in mathematics. Of the 1144 high school science teachers in the state of Kansas in 1955-56, the single most frequent major was physical education, and only 26 teachers had majored in physics though 251 were teaching physics. Similar results were found for mathematics teachers some two years later. A study done in Ohio about the same time found that only about 18 percent of high school chemistry teachers had majored in chemistry and only about 8 percent of physics teachers had majored in physics. Some 35 percent of the chemistry teachers did not even have a minor in the subject, and almost two-thirds of the physics teachers lacked a major or minor in physics.

As a result of the Russian launch of the Sputnik satellite into orbit in 1957, there was a great fear that the U.S. had fallen behind the Russians in space and defense, and the educational system was held largely to blame. The result was an upsurge of summer institutes and other retraining programs in the sciences and mathematics, many of them sponsored by the National Science Foundation. In addition, national fellowships and loans were provided to students under very favorable conditions if they chose to be teachers in areas of national priority such as science and mathematics, and federal assistance was provided to states to purchase teaching equipment and materials in science, mathematics and other subjects under the National Defense Education Act (NDEA) of 1958. At the same time, the states attempted to upgrade teacher training in science and mathematics and to raise credential requirements, and local school districts devoted increased energy to attempting to attract teachers in these subjects.

Presumably, by the middle 1960s these programs were bearing fruit. In 1965-66 a national survey of 60,000 teachers was undertaken as part of the Equal Opportunity Survey that led to the well-known Coleman report. In a separate analysis of those data, the backgrounds of teachers were compared with the areas in which they were teaching for four metropolitan regions representing different parts of the country. Among the four regions, fewer than half of the courses in mathematics and science were taught by teachers with majors in those subjects, varying from a high of 47 percent for the Philadelphia region to 39 percent for Detroit, 35 percent for New Orleans, and 28 percent for San Francisco/Oakland (Levin 1968: 5-27).

Even these measures would tend to overstate the appropriateness of teacher preparation, since they require only that the major be within the sciences or mathematics rather than in the specific subject that was being taught. Accordingly, the data would not uncover the relative abundance of biology majors who were teaching chemistry and physics or mathematics. And, as usual, many persons with little or no college training in science or mathematics taught these subjects. For example, in San Francisco/Oakland 7 percent of the persons teaching science and mathematics had majored in physical education and another 10 percent had majored in business, home economics, or industrial arts. In the New Orleans metropolitan area there were as many elementary education majors teaching science and mathematics as science and mathematics majors (Levin 1968: 5-25).

An analysis of new teachers who had been hired suggested that only the most modest progress had been made in response to the national, state, and local attention given the problem. For example, in the Philadelphia region only 57 percent of science and mathematics courses taught by new teachers (those with two years or less experience) were taught by teachers with undergraduate majors in the sciences or mathematics compared with 47 percent for science and mathematics courses taught by all teachers (Levin 1968: 5-32). That is, some 43 percent of science and mathematics courses taught by new teachers were assigned to persons without majors in the sciences and mathematics, some seven years after the Sputnik-inspired reforms had been directed at the problem.

While systematic data are not available for the 1970s, it appears that the shortages remained despite falling enrollments and the opportunities that they provided to reduce mathematics and science shortages (Rumberger 1984). And by the latter 1970s and early 1980s, the shortages were making headlines once again. In summary, there is considerable evidence of shortages throughout the last 40 years, but it has captured the attention of public policy only when there is a pointed concern with the quality of science and mathematics education or when the shortages have reached crisis proportions.

SALARY SCHEDULES AND PERSISTENT SHORTAGES

What has been the primary cause of such persistent shortages of mathematics and science teachers? The answer is both simple and obvious, but it is not widely accepted in the public policy arena. In the overall labor market, college graduates with degrees in mathematics and the sciences have more lucrative opportunities than do other majors. Business firms must pay higher salaries to obtain their services. But school districts utilize a single salary schedule that recognizes only the level of education and the length of service of a teacher. Teacher salaries are not differentiated with respect to subject of expertise, the quality of training, or other factors. Thus schools pay qualified science and mathematics teachers no more than qualified social studies or physical education teachers.

It is widely believed that teaching has many rewards not associated with other professional jobs such as potentially shorter days, longer vacations, and the intrinsic satisfaction of helping young persons grow intellectually and emotionally. Many persons are probably willing to take somewhat lower pay to enter teaching in recognition of some of these psychic benefits. But, in 1984 the starting salaries for college graduates with technical, mathematical, and scientific training was reported to be about $28,000, while starting salaries for teachers were in the $12,000-14,000 range. Obviously, the larger the differential pay between what science and mathematics graduates can earn outside of the schools relative to teaching, the more difficult it it to attract them into teaching.

A more systematic comparison can be observed in Table One which shows the average annual beginning salary advantage for Bachelor Degree candidates choosing positions in business and industry instead of teaching for selected years in the period 1972-73 to 1981-82. These represent national averages, and the patterns may differ somewhat among the different regions of the U.S. All salary differences are adjusted by the 1982 price level to make them comparable in constant dollars over the period. To provide a standard of comparison, the average beginning salary for teachers was estimated to be about $12,800 in 1981-82 (National Education Association 1983: 22). There are three important patterns that can be observed in this table.

First, the salary advantage for entering business or industry instead of teaching varies considerably according to undergraduate major. For 1981-82 beginning teachers with backgrounds in humanities and the social sciences were offered salaries that were about $1,100 to $1,300 higher in business and industry than in teaching. But, chemistry majors would have gained a salary advantage of almost $9,000 a year and college majors in physical and earth sciences almost $11,000 by choosing a non-teaching position. (Differences for chemical engineers were $14,000 in that year.) As noted above, the relative supply of biology majors has tended to be more abundant to both schools and industry with salary differentials only slightly larger than for humanities and the social sciences. Thus, the disincentives for entering the teaching profession are considerably larger for college majors in chemistry, computer sciences, physical and earth sciences, and mathematics than they are in the humanities, social sciences, and biology.

TABLE ONE

Estimated Annual Salary Advantage for Bachelor Degree Candidates
Choosing Positions in Business and Industry Instead of
Teaching for Selected Years 1973-82
(All figures in constant 1982 dollars)

Undergraduate Major	1973-74	1975-76	1978-79	1980-81	1981-82
Humanities	$ 1,119	$ 902	$ 2,204	$ 1,304	$ 1,127
Social Sciences	2,200	1,817	2,029	1,059	1,363
Biological Sciences	1,800	1,616	2,767	3,835	2,099
Chemistry	5,652	6,069	7,774	7,541	8,467
Computer Science	6,380	6,253	8,875	8,713	8,631
Mathematics	5,417	5,195	7,646	7,367	7,347
Physical and Earth Sciences	5,911	6,497	8,368	10,776	10,643

Source: Salaries in Business and Industry are taken from College Placement Council, Salary Survey, A Study of Beginning Salary Offers (Bethlehem, PA: College Placement Council, Various Years 1973-81). Salaries in teaching are taken from National Education Association, Prices, Budgets, Salaries, and Income, Winter Issue, NEA Research Memo (Washington, DC: February 1983), p. 13.

TABLE TWO

Ratio of Average Annual Beginning Salary for Bachelor Degree Candidates in Business and Industry Relative to Teaching
(Selected years 1973-74 to 1981-82)

Undergraduate Major	1973-74	1975-76	1978-79	1980-81	1981-82
Humanities	1.1	1.1	1.2	1.1	1.1
Social Sciences	1.1	1.1	1.2	1.1	1.1
Biological Sciences	1.1	1.1	1.2	1.3	1.2
Chemistry	1.4	1.4	1.6	1.6	1.7
Computer Science	1.4	1.4	1.7	1.7	1.7
Mathematics	1.4	1.3	1.6	1.6	1.6
Physical and Earth Sciences	1.4	1.5	1.6	1.9	1.8

Source: Salaries in Business and Industry are taken from College Placement Council, Salary Survey, A Study of Beginning Salary Offers (Bethlehem, PA: College Placement Council, Various Years 1973-81). Salaries in teaching are taken from National Education Association, Prices, Budgets, Salaries, and Income, Winter Issue, NEA Research Memo (Washington, DC: February 1983), p. 13.

A second pattern that can be observed from Table One is that even ten years ago, the same pattern of disincentives for science and mathematics majors to enter teaching was evident. The consistency of this pattern is buttressed by similar findings in earlier decades (Kershaw and McKean 1962: Chap. 5; Levin 1968: Chap. 5). The third pattern discernible in the data is the fact that the differentials between business and industry, on the one hand, and teaching, on the other, have grown for chemistry, computer science, mathematics, and physical and earth sciences, while staying in about the same range for the humanities, social sciences, and biological sciences. This probably accounts for the increasing difficulty of attracting teachers in the former subjects, particularly in the post-1976 period.

Table Two expresses these relative starting salaries as ratios where the numerator is the estimated average starting salary in business and industry and the denominator is the estimated average starting salary in teaching. In 1981-82 the ratio of starting salaries in business and industry relative to teaching for the humanities, social sciences, and biological sciences was about 1.1-1.2, while for the other sciences and mathematics the ratio was considerably higher at 1.6-1.8. Even in 1973-74 there was a considerable difference in the ratios between the two groups, but the differences had grown considerably by 1981-82.

In summary, the salary data provide ample reason for explaining why schools have had persistent difficulties in hiring sufficient numbers of teachers in chemistry, computer science, mathematics, and physics and why the shortages seem to be getting more severe. Many college graduates would be willing to sacrifice $1,000-$2,000 in annual salary to enter teaching, but few would be willing to sacrifice $7,000-$11,000 a year. In fact, the differences in beginning salaries may understate the expected differences in salaries over a teaching career. The typical salary schedule for teachers provides increments for about 12-15 years of experience before the top of the salary schedule is reached. This would mean that a person entering teaching at the age of 22 or so would reach the maximum salary attainable (except for cost-of-living adjustments or other improvements in the overall schedule) by about age 35. In 1982-83 the average teacher's salary was estimated to be only about $20,531 (National Education Association 1983: 13), a level that is lower than the starting salaries for new bachelor's degree candidates with engineering, science, and mathematics majors in industry and business. And, relatively few school districts offer maximum salaries above $30-35,000 a year, even for teachers with doctorates and many years of experience.

ALLEVIATING THE SHORTAGES

There have been historical shortages of teachers with training in mathematics and the sciences (except biology), and that shortage can be traced directly to salary policies that do not consider the area of specialization of the teacher. In recent years the shortages seem to have become worse as the salaries paid to persons with mathematics and science backgrounds have risen further relative to those paid to teachers. The only effective solution in the long run will be to differentiate salary schedules for teachers to attract "scarce" talent.

Salaries in the general market are higher for science and mathematics graduates for two reasons. First, relatively few persons major in these subjects because their study requires a rare kind of talent and a high level of effort relative to that required for the social sciences and humanities. This is not to deny that the highest level experts in virtually all fields are very talented and have expended special effort in their studies. However, at the undergraduate level the intellectual requirements and demands upon students are generally viewed as being more stringent in mathematics and the sciences (and perhaps engineering) than in other subjects. Few would deny that from the student perspective, bachelor degree programs in mathematics, physics, or chemistry are more demanding and rigorous on the average than typical degree programs in the humanities and social sciences.

Second, the prodigious appetite of defense industries for technical and scientific talent has bid up the price of such persons even beyond the higher salaries that they would normally receive in a market economy. It is estimated that between 15 and 50 percent of all scientific and technical personnel are employed either directly or indirectly by the Department of Defense (DeGrasse 1983: 101; National Science Foundation 1984). Differences in estimate are largely due to different definitions and time periods of the analysis. Given the well-known generosity of the federal government in funding defense contracts and the lack of incentives for keeping down costs, the pay offers of such enterprises have probably been one of the most important influences in escalating salaries of scientists, mathematicians, and engineers.

In the absence of special salary increments for science and mathematics teachers, the shortage will not be eliminated. In fact, it is likely to increase, despite the proliferation of federal and state-local initiatives to stem the problem. The shortcomings of these initiatives will be discussed below. What is important to stress is that there are at least two factors operating at present which tend to exacerbate present shortages. First, the national commissions and other groups pushing for reform in American secondary education have urged the requirement of additional courses in the sciences and mathematics for meeting high school graduation requirements (National Commission on Educational Excellence 1983; Task Force on Education for Economic Growth 1983). The states have followed this lead by increasing graduation requirements in these subjects and adding new requirements in "computer literacy" (U.S. Department of Education 1984). As these new requirements are implemented in future years, there is likely to be a substantial rise in the numbers of mathematics and science teachers required by the schools.

Second, defense expenditures will continue to rise rapidly through the 1980s according to present commitments and pressures by the Reagan administration. Not only would they rise from about $228 billion in fiscal year 1982 to $326 billion in 1987 (in constant 1982 dollars), but the portion allocated to weapons systems development and procurement is expected to increase from about one-quarter to one-half of total allocations. It is the development and production of weapons systems which creates the most important component of demand for scientific and technical personnel by the military. Thus, these two developments in military budgets suggest increased competition by the Pentagon and the industries that it supports for college graduates with scientific and technical degrees (Dale 1983; National Science Foundation 1984).

The schools must have the flexibility to provide salary inducements to prospective teachers with mathematics and science backgrounds that reflect the market situation. It is only by providing salary differentials according to field of specialization that higher educational institutions have been able to maintain a faculty composition with appropriate qualifications (Woo 1984). It is instructive to realize that in post-secondary education it would not be acceptable to use physical education specialists to teach courses in chemistry or history specialists to teach courses in mathematics in order to hold to a unified salary level for all faculty regardless of their areas of training. Otherwise stated intentions to upgrade the quality of instruction and increase student course requirements in these subjects while simultaneously reducing shortages of qualified teachers will be empty rhetoric.

Other Alternatives

But, what of the alternatives for increasing science and mathematics teachers without resorting to market incentives? The two most prominent approaches of both the federal and state governments are the retraining of teachers from other majors and the provision of scholarships, low-cost loans, and "forgivable" loans for persons who prepare to teach in the sciences or mathematics (Education Week 1983; U.S. Department of Education 1984). Forgivable loans do not have to be repaid if the recipient teaches for a specified time period. It is a paradox that these are the principal responses of the federal government, and particularly the National Science Foundation and U.S. Department of Education, since they represent the same policies pursued by the same agencies or their predecessors that did not work in the post-Sputnik period. Why did these policies fail in the past, and why must they continue to fail?

Simply training more science and mathematics specialists does not change the incentives for newly produced graduates to pursue non-teaching careers or for existing teachers to leave teaching. As long as the salaries offered by non-school employers are sufficiently in excess of those offered by schools, relatively few science and mathematics graduates will choose to be teachers or remain in teaching. Government loans to science and mathematics majors to induce them to enter teaching can be easily repaid out of the higher earnings in industry, and some employers will be willing to repay the loans as a recruitment device. The same fate is true of government-sponsored efforts to retrain existing teachers from other backgrounds for science and mathematics positions. Teachers who become competent in these subjects will still face more lucrative options outside of the schools. This means that although some of the graduates or retrained teachers will become science and mathematics teachers, it is unlikely that enough of them will enter teaching or stay there, given the substantial sacrifice in salaries.

A difference in salary of $7,500 to $11,000 a year is equivalent to the annual return on an investment of about $100,000 at current interest rates. The present evidence and the historical record suggest that few persons would be willing to give up that kind of investment to enter teaching.

Likewise, the other solutions are also unlikely to stem the shortages. For example, educational technologies such as computer-assisted instruction or video technologies (cassette or disk) may have the promise to reduce teacher need, but there simply is no software or programming available at the present time that would fulfill that promise. Moreover, it does not appear that producers of computer software, video-cassette or video-disk courseware are willing to make the large investments necessary to provide technological alternatives to teacher-based science and mathematics courses (Levin and Meister 1985). Indeed, it is interesting to note that the optimism expressed by Kershaw and McKean (1962: 141-143) over two decades ago on how educational television might help alleviate the problem has not been even partially realized.

Although the enlistment of part-time teachers, retirees, and personnel loans from industry and the military might fill small gaps in need, such actions are piece-meal at best and useful only for temporary and minor shortages rather than long-term and massive ones. All of these solutions must fail because they ignore the central cause of the shortages, market incentives that must inevitably undermine the selection of teaching as a profession by persons with backgrounds in mathematics and science.

CHANGING SALARY POLICIES

The most important element in considering a movement away from the single salary schedule is to recognize that the approach must be flexible enough to address both present and future shortages. The salary differential required to attract sufficient numbers of science and mathematics teachers may rise or fall over time, and other teaching areas may also experience shortages in the present or future such as special education and bilingual education. Accordingly, the first criterion for setting out a more flexible salary approach is to avoid a rigid formula that applies only to existing shortages in favor of an overall approach that can accomodate both present and future ones. This approach should permit the possibility of providing increments for any area of shortage as well as varying the increment according to market conditions.

A second criterion is that salary differentials should be awarded only to persons with the proper qualifications rather than to teachers without qualifications who are teaching in the fields of scarcity. Salary differentials should serve as inducements to attract scarce and qualified talent into teaching rather than as an inducement to obtain unqualified persons to teach courses for which specialists are not available. For example, if a mathematics major is the qualification that is sought, a salary differential should be available to persons with that level of attainment rather than to other majors who are assigned to teach mathematics.

A final criterion is the recognition that there is a crucial tie between shortages and the overall salary schedule. If teaching salaries are generally low relative to those of non-school employers, there will be difficulties in obtaining highly qualified persons in all fields. Although it will be easier to attract persons with humanities and social science majors into teaching than with mathematics and science majors, those who enter teaching will not likely be among the more highly qualified, even in these fields. The modest level of present teachers' salaries may explain much of the perceived concern with inadequate teacher quality in recent years (Vance and Schlechty 1982; Weaver 1984). Raising overall salaries may be necessary to attract a pool of applicants from which talented members may be selected for teaching. At higher average salaries, the necessary salary inducements to attract science and mathematics majors into teaching may be smaller than at lower ones. Moreover, it is important to recognize not only starting salaries, but the ability to make salary progress over the teaching career. Whether this implies a system of merit pay or greater availability of career ladders in teaching is beyond the scope of this paper (Murnane 1984).

In summary, salary differentials should be used to attract talent in shortage areas wherever they arise rather than limiting the plan to science and mathematics teachers. Moreover, the plan should be flexible enough to reduce differentials if market patterns change. For example, it is possible that after the present massive military build-up there will be a leveling or even a cutback in weapons development and procurement. This phenomenon would reduce the market alternatives for technical and scientific personnel so that they would find teaching to be a more attractive occupation, and salary inducements to enter and remain in teaching for such persons might be reduced or even eliminated. Differentials should be awarded only to persons with the proper qualifications rather than persons teaching in areas of scarcity. Finally, higher salaries for teachers and expanded career ladders within teaching may reduce the magnitude of required differentials to attract scarce talent.

Specific Plans

Given these three criteria, it is possible to construct a variety of approaches which would reduce shortages of qualified mathematics and science teachers or other specialists. The two main principles of such an approach are to first establish a basic salary schedule which is adequate to attract teachers of the general quality that are desired and to add increments to that schedule at all levels to attract and retain persons with special skills.

(1) Basic Salary Schedule

The advantage of retaining the basic salary schedule is due to both its simplicity and the fact that it has long been an instrument for collective bargaining. Its simplicity derives from the fact that teachers and administrators can observe at a glance the salary level associated with a particular set of qualifications, especially degree level and length of service. By maintaining this tradition, it will be easier to provide special increments for attracting scarce talent rather than by replacing the basic approach with a more complicated device. However, the overall level of teachers' salaries, their differences according to educational level and experience, and their structure in relation to career opportunities with greater responsibility must be considered in revamping the basic salary schedule. Both starting salaries and increments for further training and experience should be adequate to attract persons with appropriate qualifications--regardless of undergraduate major--and to retain them. Whether this approach requires a system of teaching levels or ranks as one finds in the university, mentor teachers, or merit pay is important to consider as well as the overall salaries required at each level to ensure attractive career paths for prospective teachers.

(2) Increments for Scarce Talent

Both the areas of shortage and the increments required to attract sufficient teachers with qualifications in those areas will vary among states and localities. Accordingly, it is important to provide a framework which will enable school districts to provide increments as needed rather than setting out a rigid state-wide scheme that must be used. The role of the state can be two-fold. First, school districts will need to know if their inability to attract and retain enough qualified teachers in particular fields is merely idiosyncratic or is caused by an overall market problem. It is possible that in any given year, a district will not receive enough qualified applicants in a particular field or will not be able to obtain enough acceptances among the teachers to whom employment offers are tendered. To the degree that this situation is due to idiosyncratic factors that just vary from year-to-year or to an overall salary schedule which is inadequate to attract qualified teachers, the provision of increments for particular fields is probably inappropriate. The existence of idiosyncratic factors such as making too few offers or just getting a bad luck-of-the-draw are unlikely to be persistent, and special increments are no solution to an overall salary schedule that is inadequate. In the former case, luck may improve or more offers can be made. In the latter case, it will be necessary to improve the general level of salaries and the attractiveness of employment in the district.

The state can assist districts in knowing the origin of the problem by collecting data on an annual basis that indicates the areas in which school districts are having difficulties in hiring qualified specialists in the absence of special increments. These data could be derived from an annual survey that requests information from school districts on openings that are unfilled or filled by unqualified candidates as well as salary information on what is being offered to teachers from different fields of training. These data could be analyzed to observe patterns of employment and shortages by academic field and their relation to salary levels and offers for those fields as well as regional break-downs to show how the patterns vary across the state.

All of this presumes that there is concensus on what constitutes a qualified teacher. Although this paper sets a minimum of an undergraduate degree in the appropriate major as the criterion, that qualification is not always reflected in the certification procedures of the states. While states may wish to use the particular criterion that presently meets their certification standards, it would also be useful to analyze the market for bachelor's degree candidates in each of the teaching fields. Otherwise, the market analysis may simply be based upon persons who have prepared to be teachers by fulfilling credential requirements that may not relate to non-educational employers. Since it is the opportunities offered by non-educational employers that determine substantially the attractiveness of teaching positions, it is important to consider an educational credential that both schools and other employers can respond to. The most obvious credential in the general market is the undergraduate degree in the pertinent subject.

The state could also be forward-looking in predicting how the market may change in the near future on the basis of such factors affecting the demand for teachers as shifting enrollment patterns in the schools, the imposition of new course requirements, and changing enrollment compositions among subjects as well as trends in class size. In addition, the demographic composition of the existing teaching force could be examined for expected retirements and other sources of turnover by subject field (O'Brien 1983). These could be contrasted with factors that might potentially affect the supply of teachers including post-secondary enrollment patterns in the aggregate and by academic major and trends in salaries and employment growth of business and industry for different academic majors. This information would be incorporated into a market analysis that would indicate those fields in which the supply of teachers at prevailing salary ranges is likely to be adequate, and where it is likely that special incentives will have to be provided to attract enough candidates into teaching. Such a report might be issued every second or third year to enable school districts to anticipate future needs.

School districts would use the information provided by both types of reports to assist in determining the differentials that will be offered to attract and retain teachers in areas of potential shortage. Each school district would examine its success in obtaining adequate numbers of teachers and delineate those specialties in which increments were required. Such increments would be determined on the basis of the seriousness of the shortages as well as the guidance provided by the state on what types of salaries might be required to attract and retain teachers in each field. In general, the policy would be to provide a percentage or percentage-range for each increment beyond the regular salary schedule. This relative salary differential would apply not only to offers given to new teachers, but also to presently employed teachers who met the qualification requirement. It would be understood that the differential would change periodically according to market conditions. That is, the differential could rise or fall over time, as needed, and it could even evaporate as adequate numbers of teachers were obtained on the basic salary schedule.

Market conditions change slowly enough that it is unlikely that there would be precipitous changes from year-to-year, although changes could be significant over a five year period. Accordingly, it is probably important to maintain special salary increments over at least a two year period to test their effectiveness and to provide stability in budgetary calculations and personnel planning over such a period. Also, where the need for such increments begins to decline, an effort should be made to achieve a gradual reduction, for example over five years, so that there are no sudden downward changes in salaries. In fact, it may be advisable to provide a "hold-harmless" clause so that no salaries are actually reduced, but the salaries of other teachers are permitted to catch up over time through a slower growth in salaries of the teachers who were initially provided with the increment. Many useful details of how such a plan might be implemented are discussed by Kershaw and McKean (1962: Chaps. 9 & 10).

A Federal Role

A final issue is the potential role that the Federal government might play. Given the national interest in improving the quality of science and mathematics instruction, the federal government might assist state and local educational agencies in providing special pay increments to attract qualified science and mathematics teachers. For reasons that were set out previously, this will probably be a more efficient approach to stimulating the supply of such persons and the attractiveness of teaching employment than federal subsidies or grants, forgivable loans, and retraining programs. To the degree that a substantial portion of the higher salaries in the general market for mathematics and science majors is due to federal defense expenditures, one can argue that there is a moral obligation of the federal government to provide subsidies to state and local educational agencies to pay for special salary increments. Perhaps half of the pay differentials should be provided by the federal government because of its role in inflating the demand for technical and scientific personnel. In any event, it is probably feasible to use the block grants provided to states under Chapter Two of the Education Consolidation Improvement Act (ECIA) of 1981 to address this need, provided that the federal government augments appropriations to reflect this additional concern.

SUMMARY

The present shortages of mathematics and science teachers in secondary schools are not new. Such shortages have been present for at least the last 40 years, with only the magnitudes of the shortages fluctuating. Nor is the cause of the shortages a new phenomenon. Just as school salary policy with its reliance on the single salary schedule has not provided competitive salaries for mathematics and science specialists in the past, that practice continues to create a shortfall in the numbers of qualified mathematics and science specialists who are willing to offer their services to schools. It is only by offering special increments to attract mathematics and sciences specialists that a long-term solution can be effected. Schools can accomodate such a change in policy through careful and systematic planning. There may be much to learn from higher educational institutions in this regard (Woo 1985). Both the state and federal governments have roles to play in assisting schools to provide salary policies that will attract adequate numbers of qualified teachers for all openings.

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TEACHER SHORTAGE IN SCIENCE AND MATHEMATICS: MYTHS, REALITIES, AND RESEARCH

A Summary of a Conference Sponsored by the
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February 10-11, 1983

By

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PREFACE

A shortage of certified and qualified science and mathematics teachers is one of the most visible and critical problems faced by our nation's schools. Local, state and federal governments, education and science associations, universities, the military and private industry have all turned their attention toward this problem. Collectively, these bodies form a national movement with the common goal of ensuring the nation's role as a world leader in education, science, engineering and technology. The approaches taken to reach this goal, however, are as varied as the movement's participants. Hence, there is a need to identify and describe the most viable alternative and to focus the effort. The Improvement of Science and Mathematics Education (ISME) Team of the National Institute of Education (NIE) was established to fill this need.

The ISME Team is charged with planning and overseeing research on the science and mathematics teacher shortage. The team's specific aims are: (1) to determine and report on the state of the problem, its related issues and solutions, (2) to conduct a national conference on the science and mathematics teacher shortage and (3) to prepare a research agenda on methods of alleviating the shortage. A unique aspect of the team's work is its emphasis on teachers and the nature of teaching in science and mathematics.

One of the team's primary tasks has been completed. A conference entitled, "Teacher Shortage in Science and Mathematics: Myths, Realities and Research," was held in the nation's capitol in February 1983. The conference was designed specifically to identify the salient elements of the national science and mathematics teacher shortage, add corollary data to the existing body of knowledge and influence and guide future NIE research in the area. The conference participants represented people working on all facets of the teacher shortage.

During this conference, paper presenters and discussants focused on possible myths surrounding the teacher shortage, the realities and research concerning science and mathematics education and the programmatic solutions operated from within and outside of school settings. Five research reviews and analyses and six program papers were presented at the conference. A summary paper was commissioned that compiled and critiqued what had been presented, discussed and learned. This latter document includes quotes of key comments, statements of agreements and disagreements, and a concluding section on possible research and practice. This publication is that summary document.

Professor Thomas L. Good, University of Missouri, is the principal author of the conference summary and critique. Dr. Good is a nationally recognized scholar in research on teaching. He has served as a principal investigator on a number of research grants, has published over 70 journal articles, has authored 10 books and has written 40 technical papers. Dr. Good is no stranger to conferences, having made countless presentations at association meetings and universities both here and abroad. He also serves on both education advisory and editorial boards. He is currently the editor of the Elementary School Journal. Dr. Good was assisted in writing the conference summary and critique by Ms. Gail M. Hinkel, a research assistant at the University of Missouri.

We welcome educators, researchers, legislators, individuals from business and industry and others to examine this document and the conference proceedings from which it stems. The proceedings include the papers commissioned for the conference and the edited transcripts of the discussions that followed each paper presentation. The conference proceedings are available from the NIE. Further information about the Institute's research program in science and mathematics education can be obtained from Dr. John L. Taylor of the Improvement of Science and Mathematics Education Team.

Shirley A. Jackson
Associate Director

INTRODUCTORY NOTE

The conference was opened by the Honorable T. H. Bell, United States Secretary of Education and Dr. Manual J. Justiz, Director of the National Institute of Education. Their remarks set the stage for two days of invigorating presentations and discussions devoted to the nation's science and mathematics teacher shortage.

Dr. Justiz welcomed the conference participants by noting that the gathering of individuals from such diverse backgrounds typified both the critical nature of the problem we face and the distinctiveness of the event. He accentuated the intent of the conference by commenting that, "...the National Institute of Education is not here to offer a federal solution to the issues being raised on the mathematics and science teacher shortage. The function of the Institute in regard to this conference is to assemble key people in the nation who are thinking about, writing about, looking at and acting on the problems.... After the conference, my staff and I will examine the conference proceedings to determine its implications for future research which can contribute to the improvement of science and mathematics education."

He challenged the participants to question, debate and interpret what needs to be known about the teacher shortage, its myths and realities. Dr. Justiz concluded the opening address by introducing the Honorable T. H. Bell.

The Secretary began his remarks by instructing the participants that, "As you meet to discuss the shortage of mathematics and science teachers it is important for you to consider not only the problems we face today but those we will be facing over the next three to six years." To emphasize his points, Dr. Bell stated that:

1. All across the nation, school boards are increasing high school graduation requirements in mathematics and science. ...for each additional year of study required in either of these fields there will be a nationwide demand for 34,000 additional high school teachers.
2. Teachers are leaving the teaching profession for better paying jobs in the emerging high tech industries. Therefore, we must not only increase the supply of teachers, we must also make teaching more attractive to ensure fewer teacher "dropouts."
3. To date we have not fully grasped the significance of the micro-computer as a force that will change our entire teaching and learning methods from kindergarten to graduate school.

In stating these conditions, the Secretary stressed that, "...we have a responsibility as educators to help America remain the technological leader of the world. As President Reagan observed in his State of the Union Address, 'We must keep that edge, and to do so we need to begin renewing the basics, starting with our educational system.'"

To underscore his concern, Secretary Bell asserted that, "I want every United States citizen to be aware that many other industrialized countries are providing a more intense, rigorous curriculum for their students. They are getting the results they demand. I fear that students in these countries are working to gain the education that could allow the U.S. to sink to the status of a second rate power. We must respond to this massive challenge posed by the other industrialized nations of the world."

The Secretary maintained that, "What we all know is that in order to have quality education, we must have quality teaching." Therefore, "We desperately need to establish the teaching profession as a prestigious, esteemed, and honorable calling. ...I believe (one way to do this) is to establish in American Society a new position of Master Teacher. This new position should be a much esteemed and sought after distinction among teachers. It should ...command a salary commensurate with other salaries that recognize accomplishment and great worth in American Society." Finally, Secretary Bell remarked, "We cannot continue with the status quo and build a truly great teaching profession. The time is long past due for a change."

Following the Secretary's and Director's addresses, Dr. Lee Shulman, Professor of Education and Psychology at Stanford University, was introduced as the conference moderator. He provided the orientation for the remainder of the conference, informing the participants of the operating structure for presentations and discussions, and the outcomes sought. His orientation is captured in the following excerpts from his remarks.

"In an essay by Jerome Bruner, 'The Act of Discovery,' Bruner told of the observation made by a British philosopher that there were basically three kinds of things in this world: First, there are troubles that breed feelings of disequilibrium, of unease, of discomfort, leaving us with a sense that there is something wrong that ought to be responded to, but little else. Second, there are puzzles that have a very clear structure, a very precise formulation and a very elegant design. Finally, there are problems. Problems are what we have when we find an appropriate puzzle to lay on one of our troubles."

Dr. Shulman stressed that the charge of the conference participants was more than the acknowledgment of troubles in science and mathematics education. Rather, the purpose of their attendance was to identify appropriate ways of transforming our teacher shortage troubles into problems through policies grounded in inquiry and research. Professor Shulman concluded by reminding the participants that the focus of the meeting is on the profession of teaching, the conditions of that profession, and the education of science and mathematics teachers.

John L. Taylor
Edward J. Fuentes
Improvement of Science and
  Mathematics Education Team

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INTRODUCTION

General concern over the quality of American public schools is currently evident. Over 20 major commissions and studies of American education are now in progress (see March 16, 1983 issue of Education Week for a review of these projects). This report is a summary of the papers and discussion that took place during the National Institute of Education Conference on Teacher Shortage in Science and Mathematics: Myths, Realities, and Research.

Because of restrictions on the size of this report, only a small but representative sample of the discussion and critique of papers can be included. The paper contains two major sections. The first is a summary of each paper and the discussion that followed. In the second section we discuss several of the important themes and suggestions for future research that emerged from conference deliberations.

The conference, which was ostensibly convened because of the teacher shortage, spent much of its discussion time articulating a need for curriculum reform (particularly of the quality of coursework) to make science and mathematics instruction more meaningful for the average student. Considering that many students develop a dislike for science in elementary school, merely increasing the number of courses students must take in these areas will not solve our problems. The conference therefore advocates the national study of the current curriculum in mathematics and science, and we concur. The conference did not advocate a national curriculum.

We believe that research on classroom learning and instruction will also be necessary to improve mathematics and science education. This would allow, among other things, identification of successful approaches to instruction in selected mathematics and science concepts which have been identified as important.

Another issue which conference participants agreed is of major importance is the number, and more importantly, the quality of mathematics and science teachers. Participants agreed that competent teachers will be needed to implement an updated, technologically relevant curriculum. In order to attract more talented individuals to teaching and to retain the most competent teachers, many participants advocated a restructuring of the teaching profession and the duties of teachers (teachers would participate in curriculum development, training of other teachers, etc), better working conditions, generally higher salaries, as well as a more diversified career ladder. Along these lines, teacher training programs should be examined in order to identify the characteristics of successful programs. Several participants believe that partnerships among colleges, businesses and schools will be necessary to increase the quality of mathematics and science education for both teachers and students.

Although some immediate expenditures are necessary (e.g., increased salaries), we believe that careful research and development at the national level should occur before most funds are spent. Such research will enable state and local districts to examine more alternatives and to have better criteria for making decisions about improving curriculum and instruction.

RESEARCH, REVIEW AND ANALYTICAL PAPERS

SUPPLY AND DEMAND FOR SCIENCE AND MATHEMATICS TEACHERS

Betty Vetter

Evidence of Shortage of Science and Mathematics Teachers

A survey of 50 state secondary science supervisors in 1980-81 showed that 43 of 50 reported shortages of physics teachers and 35 of mathematics and chemistry teachers. This shortage is critical and worsening. A December 1981 National Science Teachers Association (NSTA) survey found that from 1971-1980 there was a 68 percent reduction in newly employed science teachers and an 80 percent reduction in newly employed mathematics teachers. Another NSTA survey (December 1981) of 2,000 secondary principals showed that 52 percent of newly employed teachers were unqualified to teach science and mathematics. There are especially serious problems in states where high technology industries hire the best-trained science and mathematics personnel (Pacific and West South Central States).

Number of New Graduates

Nationwide, the number of new teachers graduated in the last 10 years has dropped from 36 to 21 percent of all college graduates. The number of science (a drop of 891 to 597) and mathematics (2,217 to 798) education graduates has also declined. Only 5 percent of all college-bound seniors plan to major in education, and only 1.3 percent of all education majors graduating in 1981 majored in science or mathematics education.

Shortages in the States

No national data are available, but several states have made surveys. For example, in North Carolina the percentage of new mathematics teachers as a fraction of all new secondary teachers has declined steadily since 1967. Furthermore, in no year were more than 50 percent of the prior year's graduates actually teaching. Only 55 percent of North Carolina's mathematics teachers are certified in mathematics.

Teacher Exodus to Industry

There is a serious exodus of experienced teachers. Five times more people left mathematics and science teaching for non-teaching jobs last year than for retirement. There is evidence that those leaving are the best qualified.

Quality of New Science and Mathematics Teachers

There has been a drop in the quality of new graduates preparing for secondary teaching. The Scholastic Aptitude Test (SAT) scores of students planning education majors are considerably below-average. Graduate Records Examination (GRE) and National Teacher Examination scores also show that students currently enrolled in teacher education programs are the least competent compared with those preparing for other professional careers.

Students planning to major in education also had lower Grade Point Averages (GPA'S), had taken fewer high school mathematics and science courses and fewer courses in academic subjects than other college aspirants. These differences are greater for males than females, but they exist in both cases. Among women, differences in academic qualifications between those planning to major in education and those entering other fields appear to be widening (white women make up 67 percent of those planning to major in education).

Concerning eduation majors, Virginia reports that these students scored an average of 100 points lower on the SAT than majors in other areas.

Test scores. Since 1962 mathematics scores on the SAT have fallen steadily. There has been a sharp drop in students' ability to apply classroom theory to numerical problems of everyday life from 1973-78. There has also been a steady decline in science achievement scores from 1969-1977. Scores have been getting lower on four other tests also. The SAT decline, however, has leveled from 1980-82.

Declining scores may be part cause and part effect of a shortage of qualified mathematics and science teachers. Some educators attribute the drop to "new math," while other studies show that students using these curricula do better.

High school graduation and college entrance requirements. Since 1970, requirements for high school graduation and college entrance have been lowered. Only one-third of U.S. school districts required more than one year of mathematics and science for graduation in 1982, and one-half of all high school graduates take no mathematics or science after the tenth grade. Colleges have thus been forced to extensively increase the number of remedial courses they offer. There has also been a decline in the number of science courses taken by college students not majoring in science or related areas. The proportion of high school students fully prepared to major in a quantitative field is less than one-third of all graduates, and less than one-fourth of those who enter college.

Despite extensive efforts to recruit women to science and engineering fields, they consistently take fewer high school mathematics and science courses than men. Comparing the average number of semesters of science and mathematics taken in grades 10-12 by high school seniors in 1972 and 1980, there is some increase in mathematics (3.6-4.1). However, a small increase in science courses taken by women was accompanied by a slight decrease among men.

Cause or effect? Some possible causes often given for the declining number and quality of secondary science and mathematics teachers may in some cases be effects instead. For example, have SAT scores declined because of poor or uninspired teaching, or has the continuing decline in test scores resulted in lower quality among those who seek to enter teaching careers?

Some of the reasons for the teacher shortage are obvious (e.g., low pay). Other reasons are: National Science Foundation (NSF) funding for summer teacher workshops and other inservice training, and for college science and engineering education has declined steeply over the past 22 years; and support for pre-college science education has dropped even more sharply, to a presently minimal level. While there is not necessarily a cause and effect relation, considering other evidence, such a relationship appears likely.

Curriculum development. There have been almost no curriculum development efforts since 1962. There *is* evidence that students using the "new" curricula produced in 1962 with NSF support score better on attitude, achievement, and process skills (overall 14 percent higher). Low social economic status (SES) pupils scored 24 percent higher. However, these evaluations were done in the 60's and 70's and *few teachers now teaching are qualified to teach the new curriculum*. Further, the curriculum needs modifications to account for developments in the past 20 years (i.e., computers).

International Comparisons

Japan, Germany, and the U.S.S.R. provide rigorous training in science and mathematics for all citizens. The U.S.S.R. offers *properly sequenced* material in these areas, whereas in the U.S., pupils are introduced too soon to abstractions without prior steps, and many students fail or drop out.

Public Support for Science and Mathematics Education

The public does not understand the importance of a good background in mathematics and science, but there is some evidence that their understanding is increasing (i.e., increased congressional support). Some states are supporting improved mathematics/science education by raising standards of eligibility for teacher education (but without incentives to attract better students) and by raising requirements for high school courses, especially in English and mathematics. Public opinion polls show that people are willing to support mathematics/science education with taxes. A Gallup Poll shows that 97 percent of the public see mathematics as "essential" and 83 percent view science similarly.

Consequences of the Teacher Shortage

Many schools have dropped courses and used uncertified teachers. We need better high school preparation in science and mathematics to rectify the teacher shortage. We also need an informed electorate. A national study done in 1980 shows that only 18 percent of U.S. adults are interested and informed about scientific matters. Although some improvements are being made, Vetter thinks teacher salaries must be raised and pre-college mathematics and science education improved in order to alleviate the teacher shortage.

Conference Discussion

In the discussion that followed, Steve Davis questioned whether industry attracts mathematics and science teachers or whether other careers attract all teachers. "In other words, the statistic I would be interested in is whether the percentage of science and mathematics teachers leaving for other careers is significantly higher than just teachers in general leaving for other careers." Although no one had specific data, there were anecdotal data to support the notion that teachers in all areas are leaving teaching.

Al Buccino acknowledged that the data presented by Vetter could be variously interpreted and suggested the need for long-term study of the teacher shortage. In his opinion, the problem is 10 years old and he therefore suggested identifying the type of information and monitoring that would be needed to study this issue.

NATIONAL NEEDS FOR SCIENCE AND TECHNOLOGY LITERACY--
THE ARMY AS A CASE STUDY

Wilson K. Talley

The paper by Talley is based partly on a November 1983 report by the Army Science Board. This group was commissioned to evaluate and make recommendations (for the Army as well as other groups) concerning several "trends" in United States science and engineering (S&E): (1) a national shortage of scientists and engineers, (2) a loss in the "technology" race with other countries, (3) curriculum problems in primary/secondary mathematics and science and (4) instruction/facility limitations in universities. Briefly, the Board concluded that the Army has no shortage of S&E's, and that problems are more likely to be related to quality of personnel rather than quantity. Nevertheless, the report states that the Army is concerned about the generally low national level of technological literacy.

Supply and Demand Estimates

Supply--and to a greater extent, demand--estimates of future scientific talent are very unreliable (e.g., sampling bias), although statistics about a particular area are more accurate. Furthermore, students must usually make the decision to pursue a career in S&E by the 11th grade. However, students' most common source of information about job opportunities is television and newspapers, where the information usually concerns unemployment, with only an occasional report of a shortage. Because of the 6 to 10 years required to train S&E's, the U.S. tends to have cycles in its supply of S&E's.

In the end, the most important factor in evaluating the validity of supply/demand predictions may be who is making the forecasts. For example, those associated with industry usually predict shortages, hoping to attract more students and eventually to more easily and cheaply obtain S&E's. Conversely, professional societies most often predict a bleak future for S&E jobs in an attempt to protect their members' careers. Finally, colleges and universities take a middle stance; they need S&E students, but their graduates must also have jobs.

As stated earlier, neither statistics nor interviews with Army Research and Development (R&D) managers indicate that the Army is unable to attract and retain an adequate number of S&E's. (The Army employs only 1.2 percent of all S&E's.) However, in the event of a serious shortage, and in attempts to hire quality personnel, the Army is at a disadvantage compared to other institutions (e.g., time-consuming hiring procedures, lower pay).

Reducing Demand

Even though the Army seems to have a sufficient number of S&E's, there is a definite lack of objective indicators concerning their quality. It makes little sense for the Army to spend millions on increasingly higher technologies (e.g., computers), if no people to maintain, operate and repair the systems are available.

There are several ways to correct imbalances between supply and demand. First, the Army may need to change the way it uses defense contractors. Competition among several contractors may result in largely wasted effort by many of the best S&E's of the losers. Furthermore, many Army design criteria emphasize low initial cost over procedures for upgrading a system once it is operating.

Increasing Supply

Training scientists and engineers. Data compiled by the American Society of Engineering Education indicate that the overall student/faculty ratio in U.S. engineering schools has increased almost 50 percent since 1974, and the number of new engineering Ph.D.'s has been declining since 1972. If these trends continue, the quality of undergraduate engineering education is likely to deteriorate.

As possible solutions to these problems, in June 1982 the deans of 287 accredited engineering schools recommended a short-term reduction in undergraduate enrollment and incentives to increase the number of graduate engineering students. However, other, less drastic solutions are discussed below.

Increasing the high school graduate pool. There has recently been much concern over the lack of scientific and technological literacy of most high school graduates. Many factors contribute to this situation. First, few secondary pupils (about one-sixth) take any mathematics or science courses beyond the 10th grade. Only one-third of 17,000 U.S. school districts require more than one year of mathematics or science to graduate. However, the pool of high school graduates that could major in S&E is still larger than the number who do major in these fields. In fact, fluctuations in the number of S&E majors in college are more dependent on high school students' perceptions of career opportunities than on the quality of secondary mathematics and science education.

Increasing general technological literacy. A more serious difficulty is the ability of the increasingly technological U.S. society to function well if citizens do not understand technology better (i.e., uninformed electorate). For the Army, this means that newly recruited or enlisted personnel must receive extra technological training. Some high school graduates with little background or aptitude for mathematics and science go on to college and some choose to be primary and secondary teachers. Because few of these people take advanced mathematics or science in college, few are well qualified to teach these subjects. The National Science Teachers Association found in a recent survey of the Pacific States that 84 percent of newly employed science and mathematics teachers are unqualified to teach in these areas. In addition, a study by Hurd (1982) indicates that 50 percent of U.S. teachers hired to teach mathematics or science in 1981-82 were unqualified or teaching with emergency certificates. And, of course, because even qualified teachers in these areas are rarely compensated adequately, many switch to jobs in business and industry. Finally, students who are taught mathematics and science by teachers who are ill-prepared to teach these subjects are not likely to be very interested in taking more courses in these areas.

Solutions and the Army's Contributions

First, the demand for scientists and engineers should be reduced. In addition to the methods mentioned earlier (reduce competition among contractors, design systems which can easily be improved), computers should be used for various types of S&E work.

Second, new S&E's must be provided and the skills and talents of existing S&E's need to be upgraded. For example, defense contractors could be allowed 100 percent recovery of university-related expenditures for fellowships, equipment, etc. The Defense Department itself can also directly aid universities by expanding scholarships in relevant areas, employing faculty as consultants and establishing and supporting "Centers of Excellence" at universities (particularly in neglected research areas). A major goal related to these activities should be stability in funding patterns which will create pools of talent and products in specific, vital areas.

A third and more drastic solution is that the Department of Defense participate in the college education of S&E's and in conducting research.

A final recommendation is that the Defense Department (which has laboratories throughout the country) also contribute to science and mathematics eduation in primary and secondary schools by providing release time to government S&E's to teach in public schools (certification requirements would need to be waived); providing equipment and laboratory facilities; starting enrichment programs; and supporting the work of commissions who are investigating mathematics, science and technology education.

Conference Discussion

In the discussion that followed, Bill Aldridge indicated that he agreed with Talley's assertion that we should be concerned about improving the technological literacy of the population in general rather than better training of scientists and engineers. He stated, "we all know that the curricula of the '60's in the secondary schools were designed principally to prepare scientists and engineers. We also have firm evidence that those curricula are inappropriate to the present student body, that is, for the majority of them. Now our concern is, in all the federal programs, in all the bills that have been introduced in Congress, none has proposed large national efforts at redevelopment of the curricula. Instead, they want to provide all 17,000 school districts with an opportunity to reinvent the wheel in all 17,000 places."

Most conference participants believe that major curriculum reform is needed. Vetter and others suggested that we are in desperate need of new curricula and Lee Shulman argued that forcing students to take the same chemistry or algebra II they have been avoiding the last 20 years is no answer.

There was general agreement that curriculum reform is too complex and too expensive a task for an individual school district or state, and thus an agency like the National Institute of Education must help coordinate the study of reform. For example, Doug Lapp, science coordinator from the Fairfax County Schools in Virginia, noted that although his school district is the tenth largest in the nation and perhaps has the highest median income, the district could not attempt curriculum reform alone. As Lapp stated, "...and I'd like to say we just don't find it possible, and I don't think we ever will, to assemble the expertise to develop curricula of the quality that is required in science and technology and keep those current...local districts can assume control and maintain control over the curriculum by using an eclectic approach, by combining elements developed from various projects into things that fit local situations, local capabilities, and facilities. But in no way can they develop curricula without academic support from universities..." He suggested that the national curriculum projects in the '50's and '60's were excellent models that need to be duplicated by development efforts in the '80's.

RESEARCH IN SCIENCE EDUCATION: REVIEW AND RECOMMENDATIONS

Wayne Welch

Introduction & Problems

In the past decade science education has suffered from declining test scores, shortages of qualified teachers, loss of federal support and less curriculum time. Some persons claim that a national crisis exists. However, in the past few months a renewed interest in this area has been reflected in the doubling of NSF's budget for science education, increased attendance at national meetings, the establishment of a commission on pre-college education in mathematics, science and technology and the increased work of professional societies. Furthermore, results of the 1981-82 national assessment (Welch & Anderson, 1982) indicate that declines in science achievement at ages 9, 13 and 17 have stabilized.

Synthesis of Recent Research

This research review (a needs assessment of research) covers the total domain of science education (contexts, transactions, and outcomes--see Table 1).

Welch's definition of a needed area of research has three aspects: (1) gaps in knowledge in an important area, (2) high national priority and (3) a promising area that has little prior research.

Major data sources for Welch's review were: yearly reviews of research supported by ERIC-SMEAC, several meta-analyses, the NSF-supported status studies, national assessment results and the work of Project Synthesis.

Welch concludes from his review that the seven most promising (moderate amount of research thus far; evidence of effect) areas for needed research are: school climate; home environment; student behaviors; resource exposure; career choices; student attitudes and classroom climate. Welch notes that the absence of teachers and teaching behaviors from this list surprised even him. However, except for the influence of teacher training programs on teachers,

TABLE 1

Domain of Science Education
Examples of Categories

1. Context (entry conditions)
   - a. Student Characteristics (i.e., interests, previous experiences, abilities, attitudes)
   - b. Teacher Characteristics (i.e., philosophy, preparation, perceptions, personal traits)
   - c. Science (i.e., content, processes)
   - d. School Climate (i.e., bureaucracy, policies, physical appearance, community influences)
   - e. Societal Imperatives (i.e., environmental quality, societal views of science and/or technology, health and well being)
   - f. Home Environments (i.e., vocation, family structure and function, physical features, philosophy)
   - g. Curriculum Materials (i.e., texts, laboratory guides, films)
   - h. Science Facilities (i.e., classroom/laboratory, materials, budget)
   - i. Goals (i.e., philosophy, students, school board and other outside groups, departmental)
   - j. Science Education Network (i.e., communication groups, professional societies, research reports, cooperative efforts)

2. Transactions (interactions)
   - a. Teacher Behaviors (i.e., procedures followed to promote instruction)
   - b. Student Behaviors (i.e., activities of students in the classroom)
   - c. Instructional Resource Exposure (i.e., enrolling in science, TV, engaged time)
   - d. External Influences (i.e., strikes, budget cuts, space launchings)

3. Outcomes (results of instruction)
   - a. Student Achievement (i.e., test scores, other measures)
   - b. Student Attitudes (i.e., student feelings about science and science learning)
   - c. Student Skills (i.e., observation, measurement)
   - d. Teacher Change (i.e., satisfaction, burn-out, knowledge)
   - e. Scientific Literacy (i.e., more knowledgeable concerning meaning, limitations and value of science)
   - f. Career Choices (i.e., science or science teaching)
   - g. Institutional Effects (i.e., loss of status, narrow-focus, structure changes)

extensive study of teachers "has not yielded promising results." The mean correlation of teacher characteristics with teacher behavior was only .05, and teacher behaviors had a mean effect size of .22 on student outcomes. Students' activities and characteristics and the context in which learning occurs seem to have more potential for future research in science education.

Other Needs Assessments

Table 2 shows the research priorities of five other recent needs assessments in which information was gained through survey techniques (e.g., teachers; university science educators). Welch examined these five assessments in relation to his definition of the domain of science education. Several conclusions are apparent from Table 2. First, Welch's research needs analysis, which is based on the extent and effect of prior research, results in different priorities than those yielded by the survey techniques. Second, survey needs assessment emphasizes teachers, curriculum and student cognitive development. Welch's review did not emphasize these areas because a great deal of work has already been done, and the studies thus far are not very promising. Third, environmental influences (e.g., home, school, classroom) are almost totally ignored in the surveys as potential areas for study. However, Welch's synthesis indicates that these are promising topics. Fourth, career choices in science and science teaching were not ranked high in most of the surveys, perhaps because the surveys were conducted in 1976-79, and most of the teacher shortage concerns have only been voiced in the past few years. Finally, four aspects of the science education domain were not highly ranked in any of the studies: student skill outcomes; changes in teachers resulting from the teaching process; institutional change and external intrusions.

Because there has been little research in the kinds of behaviors students exhibit during learning, it is not surprising that the five surveys did not include research in this area. However, Welch argues that "if students are considered the primary actors in the learning process instead of teachers, then the study of appropriate behaviors (e.g., engaged time) seems highly desirable."

Research Questions

Welch believes that answers to the following questions will help most to improve the teaching and learning of science:

1. How and to what degree do the environmental conditions of the home, school and classroom influence science learning?

2. How can student attitudes be measured more effectively and what factors determine these attitudes?

3. What facilitates or impedes students' exposure to the necessary instructional resources (science learning opportunities)?

TABLE 2

Summary of Research Priorities

Element	Welch	NIE-NARST	Butts et al.	Yeany	Yager et al.	Abraham
Context						
Student Characteristics		X	X			X
Teacher Characteristics		X	X	X		X
Science			X			
School Climate	X					
Social Imperatives		X				
Home Environment	X					
Curriculum Materials			X	X	X	X
Facilities/Equipment				X		X
Goals			X			X
Science Education Networks					X	
Transactions						
Student Behaviors	X					
Teacher Behaviors		X	X	X	X	X
Instructional Resource Exposure	X	X		X		X
Classroom Climate	X	X				
External Intrusions						
Outcomes						
Student Achievement			X	X	X	X
Student Attitudes	X	X	X	X		X
Student Skills						
Teacher Change						
Scientific Literacy		X			X	
Career Choices	X			X		
Institutional Change						

Xs are unranked

4. What specific student classroom behaviors are necessary for effective science learning?

5. What determines the science career choices of students and teachers and how can these decisions be influenced?

The research outlined above is needed to determine the causes of shortages of science teachers and career scientists, declining enrollments in science classes, and lower science literacy among the population and to identify means of reversing these trends.

Conference Discussion

There were two discussions of Welch's paper. The first discussant, Rustum Roy, strongly reinforced themes that had been expressed earlier in the day. Specifically, he argued that the goal of science/mathematics education should be to make the average citizen technologically literate. The problem from his perspective is not the training of the top one percent of students, but the curriculum that average students receive. He also acknowledged the need for curriculum reform and emphasized that the curriculum is too abstract and does not contain enough application.

Although the other discussant, Robert Yager, generally agreed with Welch's paper, he expressed some disappointment in Welch's emphasis on content (the facts of science) rather than the process of science. He suggested that a philosophical perspective should be added to Welch's conceptualization of the field (see Table 1): "It seems to me that this lack of the philosophical perspective, a lack of any view as to what science teaching is about, and what science education is about and what the fundamental mission of our discipline is, is a problem."

Yager stressed the mismatch between the science that is being taught and that which is needed (as did Roy). He suggested that the curriculum used in most classrooms is inappropriate for 95 percent of our students. Yager also stated the need for more attention to instructional theory and the study of teacher behavior. It is worth noting that although Welch did not advocate research on teacher behavior, all five of the other recent attempts to identify research priorities that he cites recommend additional work in this area (see Table 2).

According to Yager, "...we have paid no attention to instructional theory. And again it is fair to say that there is a mismatch as far as what is being done, the strategies that are being followed and what we know should take place.... As we have gone around visiting six centers of excellence, we have been amazed at the number of these programs where there has been a concern for curriculum, but there is practically no knowledge of and no interest in instruction. And we think this is a serious problem."

Despite the problems of curriculum and instruction, Yager contends that there are some exemplary programs and teachers and he suggests that one reason these are excellent is because they understand what they are attempting to accomplish. He suggests that data clearly indicate that the longer students study science the less comfortable they report being with this subject; hence, more teachers and the same curriculum will not alleviate problems in this area.

One of the authors was asked by Lee Shulman to respond to Welch's paper, when Shulman expressed some concerns with Welch's position: "I, too, have some fairly serious quibbles with Welch about his meta-analysis, especially with respect to teaching behavior, but I trust that Tom Good will handle that one..." We will take this opportunity to respond.

In general, Welch's paper is a useful characterization of science education in the past, present and future. However, we believe that the study of one aspect of the learning situation independent of other variables is unproductive. Thus, the call for increased research on students, independent of instructional behavior and the curriculum tasks that students are assigned, will not be as useful as more integrative research.

Welch is correct in arguing that teacher behavior research has been relatively unproductive historically. An unfortunate aspect of many meta-analysis reviews is that they equate all studies, irrespective of the quality of any individual study. Meta-analysis process-product data are especially suspect because so few studies are available that were able to measure both teacher behavior and student learning with depth and validity. Until very recently, most teacher behavior measures involved frequency counts of primarily affective behaviors so it is not surprising that they did not relate very strongly to student learning gains. Important advances have been made in recent classroom studies (e.g., more and better measurement of classroom process, more adequate sampling of teachers, more emphasis on the content in which teaching occurs, etc.) As Gage and Giaconia argue (1981), recent and more sophisticated studies of instructional behavior provide convincing evidence that variations in teacher behavior (in well controlled field experiments) are related to student achievement and illustrate that knowledge of instructional process can have important practical value. Awareness of such recent improvements in research on teaching is no doubt partly the reason that other recent attempts to establish research priorities have consistently argued for more research on teaching. Hence, we too advocate that caution be used when results from general meta-analyses are interpreted (as do Lee Shulman and others at the conference...for a useful discussion of problems of meta-analysis, see Biddle and Anderson, 1983), and agree that more research on instruction is needed (a proposal also made by Robert Yager and others at the conference).

We also believe that more study of students is needed (for an especially good example of the usefulness of classroom research on students, see a special issue of the Elementary School Journal, May 1982, edited by Rhona Weinstein). However, research on student factors will likely be more effective if it is integrated with teaching and curriculum work.

Similar concerns were expressed by conference participants. For example, Naama Sabar suggested that student initiative and task involvement could not be explained independent of teacher guidance and action (e.g., the type of homework assignment). Judith Lanier cautioned that we should not substitute research on students for research on teachers and added that we need studies of cognitive processing of teachers and learners as well as studies of classroom behavior.

TAKING MATHEMATICS TEACHING SERIOUSLY: REFLECTIONS ON A TEACHER SHORTAGE

Jeremy Kilpatrick and James W. Wilson

The thesis of Kilpatrick and Wilson's paper is that the current shortage of mathematics teachers reflects the negative attitudes of society and the educational community towards mathematics, its teaching, and those who teach it. In fact, most people do not take the teaching of mathematics seriously.

The shortage is more apparent in secondary schools; however, there is also an inadequate number of elementary teachers who are knowledgeable about mathematics and feel comfortable teaching it. The problem at the two levels is different, and long-term solutions may be harder to implement in elementary schools. Most of this paper, however, concerns problems at the secondary level.

Reducing the Shortage of Mathematics Teachers

In examining various ideas for reducing the shortage of qualified teachers, Kilpatrick and Wilson note that there is frequently a clash between short-term and long-term goals. That is, many proposals which might alleviate the current shortage seem unlikely in the long run to make mathematics teaching an attractive profession which can attract and retain superior teachers.

1. *Raise salaries for mathematics teachers*. Higher salaries seem to be the most popular solution to the shortage of qualified mathematics teachers. Aside from finding money to raise salaries, there are problems with providing differential pay for a particular group of teachers without increasing the pay for all teachers (e.g., teachers' groups lobbying against each other).

   One example of a workable program to encourage persons to become mathematics teachers is one proposed in the United Kingdom, which associates increased pay for mathematics teachers with tenure, a specialization in mathematics, proportion of school day spent teaching mathematics and teaching competence. Extra pay is not given during the first two years of teaching. Kilpatrick and Wilson note that such proposals allow a great deal of local control, which might or might not be more effective than state or national control in recruiting and retaining competent mathematics teachers.

2. *Provide incentives to preservice teachers*. Many persons see grants or loans (which are repaid by teaching) to college students agreeing to teach mathematics for a certain number of years after graduation as a quick solution. If the career of mathematics teaching is not made more attractive, however, such incentives are likely to attract people who are only teaching temporarily in order to repay loans.

3. *Change requirements to become a mathematics teacher*. Some persons contend that the mathematics teacher shortage is so severe that certification requirements should be altered. By doing so, people trained to teach in other fields, but who do not qualify for certification in mathematics, could teach. However, this procedure could eventually result in the employment of underprepared teachers and would limit the hiring of better qualified teachers.

   Students preparing for careers in business and industry might be enticed into teaching for a few years through incentives provided by business. All the proposals discussed so far assume that more money is the key to solving the shortage. However, Kilpatrick and Wilson believe that in the long run teachers' *attitudes* (commitment to teaching, morale) are more important than money. According to these authors, the solution to the shortage is not simply more money (although this will be necessary), but recruiting more students, retaining competent teachers and helping underqualified teachers to improve or to leave the profession.

How the U.S. Approaches Educational Problems

It is noteworthy that none of the proposals discussed thus far has come from teachers themselves. Kilpatrick and Wilson point out that educational problems in the U.S. have traditionally been solved from the top down, without much attempt to determine what problems exist in the classrooms. In fact, many educators, administrators, and policy makers who deal most directly with educational problems have not been in many classrooms recently. Although Kilpatrick and Wilson emphasize that teachers must be heard, they discuss several other factors (below) which are involved in the solution of problems associated with mathematics education.

The U.S. Mathematics Curriculum

Past curricula. In this century the mathematics curriculum has been affected by numerous groups (e.g., school boards, mathematicians, test developers), but input from mathematics teachers has usually been ignored. From 1900-1923 educational generalists questioned the importance of mathematics instruction in schools. In the 1930's and 1940's mathematics began to generally be viewed as socially useless and its importance in the curriculum declined.

In the mid-1950's a back-to-basics movement began, and the "new math" was introduced, but without any attempt to enlist the support of teachers. Because of this, the new mathematics was never fully implemented in classrooms, although its effect was much more pronounced in secondary than in elementary schools. Secondary textbooks and curricula changed considerably, though most of the alterations have now disappeared.

Because of the perception of the new mathematics as a failure, there was another back-to-basics, movement in the 1970's (although many schools had never given up this approach). The result was a drill-and-practice approach to instruction, and in 1980 National Assessment results showed that most students were unable to solve simple problems (Carpenter et al., 1981).

A recent report, the *Agenda for Action* of the National Council of Teachers of Mathematics, presents recommendations for school mathematics in the 1980's which do utilize input by mathematics teachers. This report recommends emphasizing problem solving and applications; re-examining basic skills; using calculators, computers, etc. in mathematics instruction and more mathematics for all students. However, the curriculum has not yet been much affected by this report, textbooks are similar to those published in the 1970's and instruction still consists primarily of drill-and-practice.

Kilpatrick and Wilson agree with the changes advocated in the report, but believe that *these changes cannot occur without competent, well-trained mathematics teachers implementing the changes in their classrooms*. In order to accomplish this, teachers will need more and better training, and some will need retraining.

How the curriculum has been viewed. Currently many mathematics classes are boring and repetitive. They are seen by most students, and perhaps by many teachers, as a necessary evil. To mathematics educators and many mathematicians, mathematics has numerous aspects (e.g., problem solving, number theory, statistics) and is challenging and exciting. The general public and perhaps many teachers, though, view mathematics as paper-and-pencil computations. When mathematics educators advocate organizing the curriculum around problem solving, the public agrees and interprets this as word problems which allow pupils to practice manipulative skills. Mathematics educators, however, have in mind a much wider definition of problem solving.

Teacher's role in curriculum change. The U.S. attitude towards curriculum reform is that "more is better," that new curricula and textbooks are successful in relation to the number of states which adopt them. The traditional myth in this country has been that the local community determines the curriculum. However, this process is disappearing as our society becomes increasingly mobile and parents who move do not want their children to "miss anything important." National college entrance tests, textbook publishers, and curriculum development projects also contribute to a uniform mathematics curriculum. However, teachers have not been true collaborators in curriculum development. Kilpatrick and Wilson believe that teachers much understand and be intimately involved in change and must be educated to do so.

Mathematics Teaching in the U.S.

What mathematics teaching has been. In the past teaching was one of the most open professions, particularly to talented women and minorities. However, persons from these groups who are well educated in mathematics can now choose from many attractive undergraduate majors and careers, and there has been a resulting decline in the teacher candidate population. According to Kilpatrick and Wilson, mathematics teaching must be presented to talented mathematics majors as a challenging and rewarding career.

What teacher education has been like. Even in 1960 the mathematics education of a typical elementary education major consisted only of two years of high school mathematics, one college course in general mathematics, and one methods course. The median number of semester hours of mathematics required for high school teaching was 15. A 1959 survey of high school teachers indicated that 7 percent had taken no college mathematics and only 61 percent had studied calculus or more advanced courses (Gibb, Karnes, & Wren, 1970).

Kilpatrick and Wilson argue that mathematics teachers need a knowledge of mathematics and pedagogy, and that "one should not be pitted against the other" in an effort to improve the quality of teacher preparation.

They also believe that mathematics educators have been too concerned with preparing teachers to survive the first year of teaching (e.g., classroom management) at the expense of providing them with long-term skills which would be useful in areas such as curriculum development, comparing curricula across grade levels, etc. In essence, teachers "have not been prepared to be mathematics educators."

Summary/Conclusion: What Mathematics Teaching Should Become

How persons view their work is important. A series of studies sponsored by NSF (Fey, 1979a, 1979b) indicates that today many teachers do not have a sense of commitment that may in the past have helped them to overcome the hardships of teaching.

Kilpatrick and Wilson believe that the long-term quality of mathematics teaching will largely depend on the kind of people recruited to the field. They argue that teaching today is simply not as attractive a career as it used to be, and the responsibility for having made it so must be shared. Finally, they suggest that teachers must be involved in research, and that they should be trained to review and critique research results.

Conference Discussion

The paper by Kilpatrick and Wilson was followed by three discussants. Antoine Garibaldi suggested the need to examine the public school mathematics curriculum and in particular to determine how the curriculum can be adjusted to meet the demands of today's technological society. He cautioned against issuing large numbers of emergency certificates and warned that many underprepared teachers may return to the classroom to meet emergency certification requirements in order to improve their financial status rather than to improve their mathematics teaching.

Andrew Porter advocated the study of the relationship between teacher knowledge of mathematics and student classroom performance, citing a paucity of research evidence. Until such research is done, it is obviously difficult to determine how to improve teacher training programs. He also wondered about the efficacy of certification in subareas of mathematics. He reasoned that preparation in a subarea might alleviate the need to train all new teachers in the broad field of mathematics.

Porter also argued for comparative research to determine what steps other countries (e.g., Japan) have taken to prevent teacher shortages in mathematics and science. He believes it is also important to study the mathematics curricula and instruction in countries which have done an excellent job of preparing citizens for life in a technological society.

Porter presented several arguments to challenge Kilpatrick and Wilson's position that mathematics was becoming a less attractive subject to teach. For example, he noted that mathematics is viewed by the public as essential and that the proportion of high school teachers with mathematics as their primary assignment has risen from 11 to 18 percent since 1961. Porter suggested that these (and other) limited data do not support the contention that mathematics teaching is unattractive; rather, he believes the problem may be that teaching in general is not taken seriously enough.

Porter notes that Kilpatrick and Wilson advocate curriculum reform on the NCTM "Agenda for Action in the 1980's," which emphasizes problem solving and applications. He suggests that Kilpatrick and Wilson are somewhat ambivalent concerning solutions to curriculum problems. He noted that the NCTM paper is a national agenda and added, "...Jeremy and Jim state that, one, the school board should have ultimate responsibility for the curriculum; two, the arena for action is in the classroom; and, three, teachers should have greater autonomy and be more involved in curriculum development. These statements suggest a certain ambivalence about the determinants of school curriculum..."

In work at Michigan State University, Porter and colleagues have found in several studies that elementary school teachers are reluctant to take responsibility for making mathematics content decisions, although they are forced to make such decisions because of lack of authoritative advice from school administrators or because of conflicting school policies that have to be resolved at the classroom level. In contrast to Kilpatrick and Wilson, Porter suggests that elementary school teachers do not want total autonomy in deciding what mathematics to teach.

We believe that Kilpatrick and Wilson are correct in arguing that teachers should be involved in curriculum content decisions (especially if they receive additional training for this task); however, the task is too general and too demanding for an individual teacher or school district, and new curriculum alternatives must necessarily be constructed on a national level. Porter's call for more research and curriculum conceptualization is important.

Jack Easley, the third discussant, primarily described recent research he has been involved in, and discussed mathematics teaching in an inner-city Japanese elementary school. The teachers in this school gave children challenging problems, allowed them to teach each other, and generally did very little active teaching. He suggests that one of the key features of mathematics instruction in this school was that the teachers never gave students much mathematical instruction. He notes, "The teachers were excellent masters of ceremonies. They used very little of their knowledge, whatever knowledge they might have of mathematics, in teaching these mathematics classes. They almost seemed, as the teacher I described, to hold it back and keep it away from the children and let the children struggle with it themselves." Easley suggested that American students would benefit from more peer instruction and less teacher direction.

As mentioned above, Andrew Porter advocated more cross-cultural research as one way to inform and to perhaps improve mathematics and science teaching in the United States. Porter's call is an important one and Easley's case study raises some significant and useful questions. However, we wonder what type of teaching occurs in United States classrooms in more advantaged neighborhoods where parents and teachers are quite serious about how much and how quickly students learn mathematics. If "student controlled" learning is dominant in such settings (which we doubt) then Jack Easley's arguments for more peer teaching are much more compelling.

One of the authors of the present paper stated during this discussion session that learning is not always optimal when students teach other students. There are considerable data collected by a variety of researchers (Noreen Webb at UCLA, Penny Peterson at Wisconsin and Robert Slavin at the Center for Social Organization of Schools) which indicate that peer tutoring or instruction does not automatically solve instructional difficulties. Some combinations of students make more progress in learning particular concepts than others and in some instances student-directed learning is very unproductive for some students.

However, we do not advocate that instruction be solely teacher-directed. No type of instruction predicts successful learning independent of quality of teaching. Student-directed learning can be beneficial. However, careful research should guide construction of such learning situations and the identification of which concepts and processes are most amendable to discovery or to expository approaches. Thus, we believe that the recommendation that teachers withhold information from students is unwise. Certainly, the amount and/or timing of information teachers provide can be incorrect, and Easley's suggestion that many teachers do not encourage students to think creatively about mathematics is a useful caution. Further, more research is needed on how to increase students' mathematic reasoning by varying the structure and process in mathematics classes.

Lee Shulman put the discussion into perspective in the following way "...I think in both the outstanding work that people like Tom Good have done, and the work that Jack Easley has done, though they may not agree on the particulars of teaching, neither of these approaches views teaching as lots of telling, and better teaching as more telling." More basic research that describes how students can be helped to understand more fully both the content and processes of mathematics and science is needed. Shulman suggests that additional research may help clarify how we should train/educate teachers, and that until such research is done we will not improve classroom teaching by simply asking teachers to take more mathematics and science classes.

PREPARATION OF TEACHERS: MYTHS AND REALITIES

Anne Flowers

Recent advances in technology mean that knowledge is out of date before it can be incorporated into school curricula. At the same time, there is a shortage of technologically knowledgeable teachers, and of qualified teachers in general. These problems are exacerbated by the lack of incentives to attract students to teaching.

The solution to the shortage of mathematics and science teachers will only be found, however, by considering the more general problems facing schools, the teaching profession and teacher education. The problem has developed over several years and results from apathy and neglect by society. The U.S. has paid the price in a population which is not sufficiently technologically literate.

In this paper Flowers discusses the shortage of science and mathematics teachers by dispelling eight myths often associated with teacher education.

Myth: Schools are Failing

Reality: U.S. schools are not failing. They have accommodated a varied population. With the exception of SAT's, students' performance on other exams has been consistent or risen slightly.

Myth: There are Already Too Many Teachers

Reality: There are not enough qualified teachers in many fields. In the 1970's an overabundance of teachers caused college students to enroll in other areas. From 1970-80 there was a 77 percent decline in secondary mathematics teachers and a 65 percent decline in science teachers. Thirty percent of experienced mathematics and science teachers are taking other jobs.

Myth: Certification Waivers will Bring Good Teachers into the Classroom

Reality: Waivers are bad educational policy and will inhibit attempts to upgrade teacher quality. A survey conducted last year by NSTA indicates that 50 percent of newly employed secondary mathematics and science teachers were considered unqualified by their principals (Walton, 1982). Even intelligent, concerned arts and sciences graduates may not be qualified to teach.

Myth: If We Pay Enough We Will Get the Teachers

Reality: In the near future education cannot match the salaries of business and industry. Thus, to compete, the conditions of teaching must be improved. A partnership of business and industry with schools is essential. For example, businesses could send their employees out to teach in public schools for 3-5 years (with tax credit), and offer summer jobs to teachers. Other suggestions Flowers makes are to reduce teaching loads for beginning teachers, give teachers adequate facilities and supplies and fewer non-instructional duties.

Myth: Teaching is Just a Matter of Common Sense

Reality: Teaching is a highly complex process requiring knowledge of: learners, teaching methods (management), resources, evaluation, educational settings and the teaching profession and ethics that guide it.

Myth: Teacher Education Students Aren't Very Smart

Reality: Studies of students who complete education degrees show that they have GPA's and test scores similar to university-wide averages. SAT's of junior education majors have risen since 1979. Also, junior education majors in a sample of 200 colleges had 2.8 GPA (1981-82), and the average GPA of education graduates was 3.0.

Myth: Teacher Education Students Spend All Their Time in Professional Education Courses

Reality: Candidates for secondary education degrees take "a highly rigorous college program--much of it in science and mathematics." Pedagological coursework is only a minor part of secondary mathematics and science teacher training. In fact, one problem may be that the training mathematics and science secondary education graduates receive may be too technical and advanced. In fact, these graduates may have studied little that is relevant to teaching high school classes. According to Flowers, secondary teachers may need more general science or mathematics courses and more supervised classroom experience.

Myth: A Single Solution is the Answer

> **Reality**: Elementary and secondary solutions are different. The problem of unqualified elementary science teachers has been neglected. Students most need good science teachers in their formative elementary years, where so much can be accomplished (students receptive to new ideas). We need a national policy for dealing with future personnel shortages.

Flowers proposes that if we are to effect lasting improvements in education we must engage in dialogue and research:

- to develop programs and techniques for the early identification of able students to attract them into teaching.
- to re-examine college entrance requirements and the general education components in light of literacy needs in other than the traditional ways.
- to strengthen the support areas for science and mathematics.
- to change attitudes toward the study of science and mathematics.
- to encourage teacher educators to explore deviations from current patterns of teacher education to accommodate new needs and challenges.

Conference Discussion

Three discussants reacted to the paper by Flowers. James Kelly acknowledged that the task Anne Flowers attempted was an enormous one, but expressed his belief that Flowers had not convincingly dispelled the myths she identified. He stated, "...in giving only a one-sentence characterization of each myth, the author fails to explain the content and arguments of the myths she purports to dispel. This makes it difficult to determine exactly what is being refuted...the proposals at the end seem to have no apparent connection with the myths and realities surveyed in the body of the paper, and several of these sound good but seem to be rather shy of meaning."

Kelly further notes that the education of teachers is a complex issue that has no simple answers: "...the author goes on to be prescriptive in areas where flexibility and alternative actions appear to be feasible." Kelly suggests that the paper by Flowers will be well received by some teacher educators but that it will not be received well by researchers or critics of teacher education. He suggests that the paper would be improved by a fuller discussion of history and inclusion of relevant research data. (He also advocates more relevant research in the future.)

Judith Lanier, the second discussant, agreed with much of Kelly's criticism: "Thus, I share a substantial amount of Jim's reaction to Anne's paper in the sense that the myths and the comments on them tend to be so broad and sweeping that it makes it somewhat difficult to tease out the partial aspects of reality or the unexamined questions that might be associated with them." Lanier suggested that problems vary (some schools and teacher education programs are successful but others are not) and that Flowers' refutation of old myths may simply consist of substituting new myths.

Lanier also took issue with Flowers' implicit suggestion that increased knowledge of mathematics and science might have deleterious effects upon teachers' classroom performance (perhaps teachers would be frustrated when they teach mathematics or science in lower tracks), and to Flowers' related suggestion of a possible reduction in the depth of subject matter knowledge required of prospective teachers.

Lanier believes that instruction is improved when teachers have a deep and sound grasp of subject matter (even when they teach lower level courses). However, she acknowledges that this is a personal belief which is not supported by data, and calls for additional research. She stated, "I think it is high time that we increase our research activity and decrease our assertions about the effects of differential subject matter knowledge on the quality of teaching and learning."

Lanier contends that it is safe to assume that teachers cannot teach what they do not know (although Easley takes a somewhat different view), and that it is time to gather more information on the nature of the scientific and mathematical knowledge that teachers have and need. We agree with Porter and Shulman, that it will also be important to identify the beliefs and preferences that lead some talented youth to pursue careers in teaching.

Finally, Lanier contends that there is a paucity of research about teacher education in general, and that additional research will help us to design better programs. She suggests that it is difficult to improve teacher education programs unless we first examine the present curricula and training.

Odus Elliot was the last discussant. Contrary to the remarks of Kelly and Lanier, Elliott "...viewed Flowers' paper not as an attempt to provide a definitive philosophical, polished statement about teacher education, but more as a vehicle for this conference to begin to identify some of the major problems that we see and that we face in teacher education."

In response to Flowers' paper, Elliott stated that in the identification of the problem he would place more emphasis on the economic issues. His rationale is that our industries are raiding schools for mathematics and science teachers because they are "suffering," "scrambling" and "trying to catch up and keep up" with other countries' high technology productivity. Therefore, the private sector has gotten the attention of many political leaders who recognize the importance of having well trained human capital to rebuild the economies of the states and nation.

Elliot suggests that from his perspective at the state governance level, the way to address industry and school problems is to place pressure on our diverse and decentralized education system. He concluded by endorsing Flowers' point that it is very important that teacher training programs in mathematics and science make sure students have adequate exposure to English and the humanities.

CASE STUDIES:

SCHOOL RESPONSES TO THE TEACHER SHORTAGE

Following the general presentation of major papers, three case studies of school districts were presented. These papers present detailed accounts of how certain school districts are dealing with the teacher shortage problem.

THE TEACHER SHORTAGE IN MATHEMATICS AND SCIENCE
THE LOS ANGELES STORY
Rosalyn Heyman

Present shortages were in part brought on by the departure of many Cuban refugees who were hired as teachers in the 60's and the departure of many former engineers (who were laid off when defense contracts moved in early 70's) hired to teach. Both groups discovered that teaching is difficult—they did not know management techniques, learning theory, etc.

Summer Programs

In the late 1970's the district started a six-week summer workshop to retrain teachers in other areas to teach mathematics and science. Teachers were paid a stipend. Also, in the 70's science teachers participated in NDEA workshops in colleges to update knowledge and skills. Funding for these programs is gone now, however.

Internship Programs

Colleges were asked to submit proposals for internships for district employees who wanted to add mathematics or science to their credentials. An advisory board of mathematics and science teachers approved the proposals. Some internships were successful, and others not. Some proved too expensive for teachers.

The same procedure was used to provide programs for teachers holding emergency mathematics/science credentials to get full credentials. This program was very successful.

The latest effort is a joint UCLA/district internship retraining program to train junior high mathematics teachers. Twenty-nine trainees took summer university classes (tuition was paid) and were paid for a three-week workshop (planning, learning theory, management). During the school year trainees take a university course and practicum each semester. The next summer they finish training with a "nine-unit university segment." This district has a full-time resource teacher who visits and supervises the teachers' work in their classes and provides individual and group inservice training. Heyman reports that because 12 of the original 41 trainees dropped out due to difficulty of university mathematics courses, the university "adjusted coursework accordingly."

Investment in People Program

This program is funded by the state.

Program facets:

1. local schools can write proposals for money for staff development in mathematics, science or computer literacy.

2. continued training of 29 teachers in internship program described above.

3. colleges can write proposals to help train emergency credential teachers in mathematics and science.

4. computer-based teacher training program to assist teachers in completing courses for certification to teach secondary mathematics. To implement this facet, five Teacher Education and Computer Centers were established in the state and eight terminals were placed in five district high schools. This program has failed because colleges are not willing to give credit for Computer Assisted Instruction.

Partnership with Industry, Government and Military

The plan is for industry personnel to donate several hours a week to instruct high school students. This program has not started yet.

Partnership for Development of National Engineering Resources Project, a group from industry and military, is interested in increased support for college and secondary S&E facilities and incentives to attract secondary science and mathematics teachers. They are exploring 10 possible actions:

1. legislation to allow incentive payment to teachers in fields with shortages.

2. review national legislation to improve science and mathematics instruction—support and lobby.

3. fund science and mathematics chairs at local high schools.

4. provide instruction from industry or military engineers and mathematicians one or two periods a day—

5. use #4 so teachers could be freed to visit industry or observe outstanding teaching.

6. use #4 to provide enrichment instruction.

7. industry provide funds to retrain mathematics teachers.

8. provide money for equipment or equipment to schools.

9. grant sabbaticals to industry or military personnel to teach for a year.

10. sabbatical leaves for teachers to work in industry.

PRIS^{2}M--A PROGRAM FOR STUDENTS BUILT UPON PROFESSIONAL GROWTH EXPERIENCES OF TEACHERS

Douglas Seager

Introduction

This program is used in Rochester, New York (a high technology center) to increase minority student enrollment in mathematics and science courses. A joint venture of business and schools, it has a ten-year funding commitment of $2 million made by 26 local industries in 1978.

There are two full-time staff: one curriculum coordinator works closely with schools to initiate and implement academic programs, curriculum and summer activities and also links schools with industry; and a community relations coordinator links community, schools and industry while promoting program goals to all three. An executive director oversees these links and promotes the program at the highest levels of the three organizations.

Program Components

1. Development of a new junior high science curriculum. The new curriculum provides more direct student experiences, alternative activities which allow some student choice and emphasizes process skills. Students also do long-term projects. Curriculum development also involves many science teachers in a professionally rewarding summer experience as they help develop curriculum.

2. At the high school level the program is designed to promote interest in engineering and in majoring in mathematics and science in college.

To be selected for membership on a PRIS^{2}M team, students must be taking advanced courses in mathematics and science, and make passing grades. Students follow a four-year sequence of coursework. Team activities include a monthly visit to an industrial presentation (based on principles of science) at the site. An additional monthly team meeting after school provides a variety of activities (e.g., science fair project development, career awareness, financial aid programs). Meetings include school faculty and industry experts. Social events for teams are also important and help to develop a sense of belonging which offsets negative peer pressure.

There are three special summer programs: (1) three-week summer science and mathematics workshop (9th grade); (2) one-week biology camp (10th grade); (3) a nine-week "Orientation to Engineering" program includes one week at a university and eight weeks of paid internship at an industry (11th grade).

Teacher Involvement

One problem with mathematics and science teaching is the inadequate intellectual challenge it presents. Teachers are bored, and exciting technological progress is largely passing them by. To develop positive attitudes and enthusiasm, $PRIS^2M$ involves teachers in several tasks, most of which they are paid for during outside school hours or summer. For example, each science and mathematics teacher selected to participate authors a new science unit and at least one module for another teacher's unit. This is an inter-disciplinary process and consultants also help (so far 30 teachers have developed units). Pilot testing of the new units is done by science teachers, but not necessarily by authors. This requires inservice conducted by authors/teachers and feedback sessions.

Unique Features of the Curriculum

Flexibility is a key aspect. There are required units and choice units, and teachers may even include a unit of their own choosing, which is not one of the program units.

In the *teacher module*, each science teacher serves as a *role model* by being *required* to carry out a scientific experiment and share the ongoing process and results with students. Teachers thus incorporate science into their *private lives*. Seeger believes science teachers in particular have not conveyed to students that skills and values learned in the classroom can be utilized *outside class* in hobbies, visiting museums, gardening, etc.

To help teachers select a problem and study it, $PRIS^2M$ has initiated: (1) a series of meetings between industry scientists and school science teachers (personal contacts also enhance pupils' science education); and (2) small grants for equipment/materials teachers need for their research projects. Anticipated long-term outcomes are that scientists will use teachers to carry out supplemental research in science classrooms and summer employment for science teachers.

TEACHER SHORTAGE IN SCIENCE AND MATHEMATICS: WHAT IS HOUSTON DOING ABOUT IT?

Patricia H. Shell

Introduction

In Fall 1978, Houston had 47 secondary science and mathematics vacancies. However by Fall 1982, there were only two mathematics vacancies and one in science. Shell's paper describes how this change occurred in a district whose student body is 43 percent black, 32 percent Hispanic, 22 percent white.

Houston's Response

First, the scope of the problem was communicated in every possible way to all segments of the community.

Second mile plan. The district developed an incentive pay plan for teachers who teach in curriculum areas or schools with shortages. The plan emphasizes four areas:

1. improving instruction
2. teacher shortage
3. staff stabilization
4. recognition of teaching as a rewarding career

To be eligible for a stipend, a teacher must:

1. hold a valid teacher certificate
2. be assigned to a school
3. be paid on a teacher salary scale
4. have an acceptable performance evaluation
5. have no more than 15 absences in three years
6. be a full-time teacher, nurse or librarian.

Employees may qualify for stipends in each of the following six categories:

1. contributing to outstanding educational progress of students (based on actual/expected school test score averages)—$800

2. teaching in an area of critical staff shortage—$600-1,000

3. teaching in a high priority location (schools with high percentage of educationally disadvantaged students)—$2,000 (Title I)

4. outstanding attendance (absent five or fewer days)

5. professional growth activities—college courses, district inservice

6. unique campus assignment—teachers who teach at a school where no test data are available because of student mobility or because students are not able to be tested with standard tests ($450-750)

The business community has supported the plan and spent several million dollars on it each year. Teacher organizations are opposed; they want across-the-board raises. However, more than one-half of district teachers support the plan.

Among many positive results are the following: vacancies reduced from 195 to 30, turnover reduced 6.8 percent and fewer absences.

Project search. This project is a local district intensive summer staff retraining program which retrains already employed teachers so they can be certified in mathematics and science. The district pays all expenses and gives a $250 stipend per course, contingent upon a grade of A or B in a course. Teachers in the program must agree to remain in the district three years or repay training costs. Applicants are carefully screened. At the end of the first training cycle, 34 teachers were placed in new positions as mathematics or science teachers.

The Houston district is addressing the image of the teaching profession, the number and quality of recruits to teaching and the quality of the teaching-learning process by raising standards for promotion and graduation; using comprehensive staff assessment and assistance; using technology to support instruction and opening two magnet high school programs for the teaching profession.

Conference Discussion

The presentations by Heyman, Seager and Shell were followed by comments by Charles Thomas and E. B. Bowerton, Jr. The discussants were generally supportive of the initiatives and directions taken, but added a number of practical concerns that those who implement such plans would need to address (e.g., How do you motivate the average teacher? How do you identify aspects of teacher quality other than the ability to produce student achievement?).

CASE STUDIES:
BUSINESS/COMMUNITY/EDUCATION RELATIONSHIPS

Following the presentation of case study responses to the shortage problem, three papers were given that focused upon how business, community, and political leadership could improve the mathematics and science education of youths.

ARGONNE SUPPORTS PRECOLLEGE EDUCATION IN SCIENCE AND MATHEMATICS

Juanita Bronaugh

Argonne National Laboratory performs nuclear-reactor related research and studies of other technologies. Many of its scientists and engineers have joint appointments with the University of Chicago. The laboratory is currently sponsoring four programs for precollege students in Chicago public schools.

I. High School Summer Research Apprenticeship Program

This program is designed to encourage minority and female sophomores to continue mathematics and science study in their junior and senior years. A six-week summer program offers exposure to many energy-related research programs at Argonne and to the personnel there. Students who participate are talented (upper 20 percent of class; two years of mathematics; one year of biology; one year of chemistry).

The program emphasizes small-group research, computer instruction, nuclear physics, crystallography, environmental chemistry and electron microscopy. Students who complete this program go on to another program conducted by the Illinois Institute of Technology in their junior year. After they graduate, some return to the Argonne Pre-college Program in Science and Engineering (PRE-COOP).

II. Pre-college Program in Science and Engineering

This program gives college-bound high school graduates the opportunity to work with professional scientists and engineers. Competition for admission is high—only 1 in 4 applicants is admitted. Emphasis is on research, and each student becomes part of an established Argonne research team and pursues an aspect of research independently or assists the group. Students write up their projects. (Bronaugh does not say how long this project lasts.)

III. Adopt-A-School

This program was initiated by Ruth Love, General Superintendent of the Chicago Public Schools, in order that schools might utilize outside resources. The Argonne Lab provides scientific support services, tours and educational programs. The program's purpose is to increase the number of minorities in science and engineering careers by having the three groups named above provide technical, financial and administrative assistance to Chicago schools to enrich the curriculum and develop student interest in careers.

Program concepts are to be initiated in three phases:

Phase I. Six elementary schools will participate in a pilot program which includes needs identification, program development, inservice, instructional assistance and curriculum development.

Phase II. Activities will be expanded to include high schools serving the six elementary schools. A sequential program plan will be developed for high schools. Additional elements in this program phase are: peer support system; tutoring; career information and recognition activities.

Phase III. The program will be expanded to include all other elementary and high schools in the Chicago area.

Most program activities occur during school hours.

Two other programs are in the planning stages:

IV. Tomorrow's Scientists, Technicians and Managers Program

This program will be held in cooperation with the Aurora, Illinois schools. Its purpose is to increase the number of minorities entering science, technical and business jobs. It will focus on selected pupils in grades 9-12 and activities will occur outside schools.

V. Saturday Science Academy

This program is for highly talented fourth graders, and will begin with a pilot program in May for 15 pupils for six weeks. Students will develop skills in creative expression of scientific ideas and use of computers in science. Argonne S&E's have prepared the program content and will lecture and give demonstrations. The program will be evaluated before it is expanded.

SCIENCE MUSEUMS AND SCIENCE EDUCATION

Bonnie VanDorn

Many pupils who are interested in mathematics, science, etc. are not being reached through the usual instructional approaches in classrooms. Many schools are therefore extending science education by working with museums. The Association of Science-Technology Centers is an organization which provides information and services to help museums improve public understanding of science and technology. A 1976 survey showed that 93 percent of science centers (museums) work directly with local schools.

The following are examples of educational programs that science centers provide:

1. Computer--classes, rent time, camps, travelling vans
2. Teacher services--help colleges with inservice education, allow teachers sabbatical leave to work at museum, offer incentives for teachers to learn about the museum, hints teachers can use when teaching, curricula
3. Science accessibility for special groups--minority students, women, disabled students and their parents and teachers
4. Gifted students
5. Outreach--most museums are located in urban areas, so many programs emphasize sending vans, etc. to schools in smaller towns
6. Special programs and events--contests, camps, having scientists in community visit schools, TV programs

Such programs can help current science and mathematics education problems in several ways:

1. Museums' unique facilities, technology, and personnel are not available in schools.
2. Informal nature of learning setting compliments classroom.
3. Museums' focus tries to create science enthusiasm in community--promotes school programs.
4. Collaborative history of museums.
5. Museum programs are cost effective.

Current and developing science centers will have a much greater effect on improving science education if the following challenges are addressed:

1. Partnerships--with schools
2. Funding--more needed
3. Research--more needed specifically about museum education, effects on various types of learners, etc.

POLICY ALTERNATIVES: EDUCATION FOR ECONOMIC GROWTH

Roy Forbes

The last formal speaker at the conference, Roy Forbes, described present work by the Education Commission of the States concerning the shortage of mathematics and science teachers. He stated that when Governor Hunt of North

Carolina became chairman of the commission he saw a need to create a task force to involve political leaders, business leaders, educators and scientists in addressing the relationship between education and economic growth. A group composed of representatives from these three areas suggested three general purposes for the task force as it attempted to improve the educational system. The first was to develop general awareness of the need to take vigorous action to improve education and to help people understand relationships between education and various economic groups. A second purpose was to develop recommendations which could be used at every level (business, education, government) to improve education. The third purpose of the task force was to promote partnerships between business and education. Forbes summarized a number of steps and policy recommendations that will soon be available.

Conference Discussion

Following Forbes' presentation, Shulman cautioned that although business involvement was welcome and needed, the quality and appropriateness of plans should be emphasized rather than how quickly plans are implemented.

Lynn Gray reacted to the papers presented by Bronaugh, VanDorn, and Forbes. He was enthusiastic about the prospects of business/education cooperation, but provided two important caveats. First, he argued that the shortage problem is severe and that most proposals, exciting as they may be, involve few teachers and students. He suggested that we need ways to help the vast numbers of teachers and students who currently populate schools. He noted that there are no immediate short-term solutions. For example, although New York City is in its 15th year of educational innovation, progress is evident now in only 30 or 40 percent of its schools. Gray argues that if progress is to occur, plans must be laid out thoughtfully and carefully, and he notes that it takes time to prepare adequate plans.

His second qualification on the business/education partnership concerns how resources would be utilized. He stated, "My last comment is a bottom-line comment. One of the things that I think happens in these partnership linkages is that we spend a lot of time thinking of the roles and relationships of the various players but we have not learned how to focus on the children and what they really need." Quick action and more resources will not produce good solutions unless a sense of purpose and direction is articulated." This position was stated earlier by Robert Yager.

THREE VIEWS OF THE CONFERENCE

In the final segment of the program three individuals were invited to respond as they wished to the conference proceedings. That is, they were encouraged to discuss new data or problems as well as to react to previous presentations and discussions. We can only briefly and selectively summarize their viewpoints here.

Steven Davis argued that one source of confusion for him as a new teacher was the belief about mathematics that, "you were supposed to teach it to make everyone a mathematician" and he feels that this is a common mistake. He agreed with Roy and other presentors that a major task is to make the curriculum more immediate and applicable to the average student. He noted that microcomputers are being placed in more and more classrooms, even though we have no research evidence about how they can best be utilized. He notes that it is ironic that some teachers use the pocket calculator to balance their checkbooks or to compute grades, yet refuse to allow students to use pocket calculators. He suggests that there is a vital need for leadership from teacher educators if classroom teachers are to use microcomputers and other forms of technology well in the classroom. He further suggests the need for teachers to become quite knowledgeable about technology if they are to help students become literate users of technology.

Robert Stake argued that the modern teacher needs "to be more reactor, commentator and director of continuing learning." He contends that standard assessments of learning are too narrow and are counterproductive. He stated, "we don't know what youngsters will need in their lives. We don't know what the demands of the future will be. We have to rely on our best guesses, of course, but we should also rely on the intentions of teachers and the intuitions of youngsters." He insists that one way to increase student interest in classroom learning is to give students more choice and to increase teacher commitment. We need to give the teacher more responsibility in selecting options for students. (Earlier, Porter reported that teachers did not assume these responsibilities and Kilpatrick and Wilson argued that teachers were not well trained for such decision making.) In essence, Stake argues that the curriculum should be more responsive to individual students as well as teachers. Furthermore, he suggests that common goals and standards prevent rather than promote educational excellence.

The final discussant, Naama Sabar, raised an interesting and compelling question from her international perspective: "How come a country that in most fields of science and technology competes so successfully with all countries in the free world, due to your wealth of ideas, quality of manpower, natural resources and facilities, has reached this present crisis in the area of teaching, exemplified here in science and mathematics education?"

Sabar believes that the crisis is in part due to an unwillingness to invest resources in teachers or to devise ways to lend status to the role of classroom teachers. In response to the need for teachers to be technologically literate, she raised the question of how many teachers could afford to purchase a microcomputer. She noted that an automobile repairman makes good money, that competent scientists have status, and that even a stage director can earn a good salary and have status (e.g., be nominated for a Tony Award). However, teachers receive little money or status. She stated, "yet, an exceptional teacher, if at all, will get recognition from his own association, and the local Rotary Club may acknowledge him as well." She suggested that, "The United States government should view education as part of its defense and security (and spend funds accordingly) if it is to maintain its position as international leader."

DIRECTIONS FOR ACTION

The summary of conference papers and discussion does not provide a clear mandate for action to resolve the teacher shortage and general literacy problem (teachers, citizens, students) in mathematics and science. Certainly there were important and healthy differences among participants in how they define the problems and in the steps they believe are most likely to solve the difficulties. The conference provided a broader understanding of the problems, identified several points which need resolution (and which call for basic research and development activities), and produced examples of what some agencies, school districts and universities are doing in response to the teacher shortage and the literacy problems. The information, ideas and problems identified at the conference will be of value to school systems as they deal with these issues and to decision makers who face difficult but important policy challenges.

As we write this document in early March, several states are passing legislation that addresses certain aspects of the problem (e.g., higher curriculum standards). The Congress of the United States is now deliberating legislation that will provide badly needed funds that can be used to help correct deficiencies in these areas.

Considering the rapidly growing public concern over these issues and the money that Congress will soon make available, we believe it is likely that the money appropriated will be poorly spent in most instances. Although the funding will probably be inadequate, careful thought before these funds are spent will (or would) have more significant, long-term effects than quick spending will achieve. We acknowledge that there is an acute shortage of mathematics and science teachers, and particularly of well-qualified teachers. The problem is enormous and important and the continued economic productivity of the United States depends upon a successful, long-term response to the shortage and the related problem of scientific and mathematical literacy. Clearly, some action must be taken immediately; however, we believe that certain aspects of the shortage can best be solved by discussion and basic research rather than by quick spending and radical changes in the curriculum that are based primarily on short-term reaction or impulse.

What, then, are the issues that the participants at this conference believe should be studied? In response to this question, we will discuss topics upon which there was reasonable consensus among participants and general problems which cannot be adequately solved by individual states or school districts. We view three broad areas as meriting attention: curriculum reform, process research on classroom learning and instruction and increasing public support (which involves altering salaries, the status and duties of the profession) of classroom teachers.

Curriculum Reform

The most prevalent view expressed at the conference about the current status of mathematics and science education was that 95 percent of our students (and citizens) need better mathematics and science training, not the top 5 percent. Participants generally agreed that the present curriculum was producing an adequate number of advanced scientists and that our supply of exceptionally talented students is not in jeopardy. Still, most of the programs described at the conference were designed to identify and to educate gifted and/or minority youth. This is of course understandable (and we need such programs), but it is regrettable that more attention has not been placed upon improving the mathematics/science curriculum for the average student. The most important issue concerns what can be done to prepare citizens who understand and are therefore capable of using technology in intelligent and appropriate ways and thus of making informed decisions about technologically-related issues. The answers to this question were varied and complex, but the most frequent response was the call for a more appropriate, relevant curriculum and for qualified teachers to implement and expand it (we will return to the teacher issue later).

Beyond the frequently stated opinion that curriculum reform was needed, there was little agreement as to what direction this reform should take (readers who wish to scientifically conduct their own content analyses of conference proceedings should review this massive report...we encourage replication efforts). In part, this is because the conference was organized primarily as a problem stating group and hence, little time was spent discussing the new curriculum. Because of declining test scores and student interest, dissatisfaction with many science and mathematics textbooks, etc., there is societal consensus that curriculum reform is needed. But poor performances on assessment instruments do not tell us what abilities should be measured or how to correct identified problems.

To many citizens and educators, curriculum reform means more courses and indeed many states have passed legislation which requires that students take more courses in mathematics and science. However, considering that many students develop a distaste for science in elementary school, mandating more course work without seriously studying the quality of science and mathematics curricula, particularly in the early grades, may exacerbate the problem.

Although most papers at the conference addressed the problems of mathematics and science education in secondary schools, we believe that if secondary science education is to be improved, it will be necessary to simultaneously increase both the quantity and quality of science education at the elementary level. Studies by Ehmeier and Ziomek (1983) and Stake and Easley (1978) indicate that most elementary pupils receive little or no instruction in science. In a study of 75 teachers in Grades 2-6, Ehmeier and Ziomek found that an average of only 15 minutes per week was spent on science in second grade classes. By fifth grade, this time had only increased to 43 minutes. Furthermore, the time spent on science in most classes was considerably lower than what the district recommended.

Still, we need further descriptive data on which to base curriculum reform efforts. Until we have such information, it is hard to know how much time should be taken from other curricula areas and devoted to science. Schools have many subjects of limited value (especially secondary schools), and curriculum reform in mathematics and science must involve an examination of the total curriculum by mathematicians and scientists, teacher educators and classroom teachers to determine how the curriculum should be altered.

Scientific knowledge is presently growing at a rapid pace and it appears that many technological advances will be made in the next few years. If the U.S. hopes to prepare its citizens to live in a world heavily influenced by technology, educators must determine what scientific information and processes students should know. What do we mean by a "technologically literate" citizen? Although there is no simple answer to such a question, we believe that it is imperative that the current curriculum be described and serious scholarship conducted to determine how it should be modified.

Although we acknowledge that the curriculum needs reform, we are not certain what the nature of that reform should be. In fact, it will be impossible to make useful changes unless there is a clear understanding of what the curriculum is and should be. We therefore urge that at least some appropriated funds be spent in 1983-84 for commissioned work designed to identify possible areas of reform and ways to achieve improvements. What do we want students to be doing in classrooms in 1993? What are the criteria that we will use in 1993 to determine whether or not the money and time expended in the past ten years have substantially improved technological literacy? Serious study of these goals in advance might make it more likely that curriculum reform efforts will be at least moderately successful.

Some excellent study of curriculum reform has been made. For example, the National Council of Teachers of Mathematics has produced a useful, comprehensive statement outlining the mathematics curriculum needed in the 1980's. This report strongly advocates more attention to problem solving but does not define problem solving at a functional level. Funds invested in carefully designed conferences, research studies and development activities might yield criteria that could be used to construct and to evaluate curricula. With criteria and a broader understanding of what is meant by problem solving (and other terms such as "scientific literacy") we could begin to answer a variety of practical and important questions such as the following: How do we operationally define problem solving? How do we differentiate appropriate problem-solving teaching from inappropriate or poor instruction? What percent of our teachers attempt to teach problem solving? How do teachers' definitions of problem solving compare to those called for in curriculum reform efforts? How do teachers whose definitions of problem solving correspond with those advocated in the curriculum reform teach (or structure their classes) problem solving? What is appropriate and inappropriate about present curriculum experiences for students?

Funds invested in development designed to clarify intended curriculum reform could use new technology (as well as describe it). For example, competent teachers who include problem-solving instruction in their curricula could be identified and videotaped and these tapes could be shown to other teachers to demonstrate techniques and activities which characterize effective problem-solving instruction. We therefore believe that if classroom teachers, educators and scientists are given sufficient funds it would be possible to identify and develop more appropriate curricula and to demonstrate them more effectively than the rapid innovation that has characterized past change in American curricula allows. As any student of educational history realizes, attempts to clarify terms involved in curriculum reform efforts (discovery learning, open education, process science, new mathematics) have traditionally come only after a reform has been tried and subsequent evaluative data are negative or uninterpretable. If conceptual clarity were achieved and implementation measures constructed, it would be possible for empirical research conducted in 1984 and 1985 to determine whether new curricula had positively affected students' skills and interest in science and mathematics.

Although we do not advocate a national curriculum, we do believe that the delineation of key curriculum and instructional terms is important. For example, there are many questions concerning instruction about an important mathematics concept like "variable:" When should it be introduced in the curriculum? What should follow? These are issues that individual school districts cannot adequately resolve with existing budgets and personnel.

In essence, each day in American classrooms, thousands of informal "field experiments" occur when teachers use their own approaches to present various concepts or principles contained in school curricula. There is growing evidence some teachers cannot improve upon the poor quality of text materials (because of inadequate backgrounds in science and mathematics) and thus distort the concepts they intend to teach, so that many students' misunderstandings of some concepts are not corrected, despite instruction. Furthermore, research on instruction in specific scientific concepts in 14 fifth-grade classes (Eaton, Anderson, & Smith, in press) demonstrates that many students bring to the classroom misconceptions about scientific concepts such as light and vision. In this study, some misconceptions were reinforced by the textbook and the accompanying teacher's guide. It is therefore not surprising that even after 6 weeks of instruction, three-fourths of the students studied still held basic misconceptions about these concepts (see Brophy, 1982 for a detailed discussion of teacher distortion of intended instruction and dependence on textbook materials).

Because many teachers do rely heavily on textbooks and teachers' guides for instruction, any attempt at reform of curriculum and instruction must necessarily include a careful examination of textbooks. Freeman, Kuhs, Porter, Floden, Schmidt, and Schwille (in press) suggest that the textbook a teacher uses largely determines the curriculum students receive. However, these investigators found that the mathematics curricula presented in four textbook series which dominate the market vary considerably. They also found considerable differences between the content of various textbook series and that measured by some standardized mathematics achievement tests.

One recent criticism of the science curriculum is that it is passive, that students learn the knowledge of science (facts, concepts, findings...generated by others) but have little opportunity to engage in the process of science. Telling such teachers to include more science process and less content in their curricula is as likely to add to the problem as to correct it. Such a recommendation would be variously interpreted and implemented. In addition to study to provide a purpose and direction to general curriculum reform, we need research and development that will help teachers understand major scientific concepts and learn alternative ways in which such concepts can be taught (to determine how the general goals of curriculum reform could be implemented in specific instances).

Although there is evidence that effective instruction can make important differences in how much students learn and retain, most of this research has not examined the learning of specific and subject matter concepts in particular contexts. Some funds should be designated for identifying important curriculum concepts, devising interesting ways to present those concepts and/or to allow students to discover them. Such work could be completed at a national level by teams composed of teachers, educators and scientists. Ultimately, the value of such work should be tested by empirical research.

We suggest that teachers would benefit from viewing videotapes of competent, talented teachers conducting classroom activities related to key concepts or issues (variable, quantum theory, place value, equivalent fractions). Although it would be impossible to film instruction in many concepts (at least initially), it seems important to assemble video libraries that illustrate the process or problem-solving skills called for in relation to particular concepts as well as to the areas of science and mathematics generally. Carefully selected video lessons would be an improvement over most classroom observation, and videotapes could be supplemented by discussion of salient aspects of teaching situations. The potential is especially great in science, where time lapse photography and other techniques can allow students to observe the efforts of an intervention or to see change occurring over time periods, and thus to get the benefits of an experiment, when actually doing one experiment in the class might be too expensive or time consuming, or otherwise unfeasible. A variety of technological advances have occurred in the past decade, but teaching has been largely unaffected by them. Such development work is cheap and relatively straightforward, and it is therefore surprising that so little has taken place.

Ultimately, such work might lead to a better understanding of issues such as productive strategies teachers can use, problems or misunderstandings students are likely to develop when attempting to learn concepts, how these misconceptions can be detected and what specific strategies teachers can use to help students with particular misunderstandings. Such basic information could improve vastly elementary and secondary education in this country. Some research in this area has been completed (see Brophy, 1982), but it has not been organized around important subject matter concepts.

Simulation/Curriculum Development

Considering that technology can also make complex phenomena concrete and accessible to students, one wonders why more first-rate simulations and videos illustrating scientific processes are not available. For example, some of the complex time/motion concepts in physics are easy to depict on video. Videotapes of important experiments in science would do much to allow students to see scientific data being collected and to witness the process of knowledge being accumulated over time until it has practical consequences. Appropriate, selective use of a few demonstrations of the scientific process could help students to develop a respect for the need to measure carefully, to change perceptions as data accumulate, etc. Naturally, videotapes would not be a substitute for students' actual conduction of, or involvement with, science experiments.

Although curriculum goals are affected by local needs and preferences, the cost of producing exemplary scientific videos and simulation activities is so high that few school districts could afford to develop them. However, once produced at the national level, they would be valuable resources for many school districts.

Several participants at the conference suggested that few students actually apply the principles of science before they pursue advanced degrees. Legislation presently being acted upon in Congress involves expenditures for the purchase of new scientific equipment as well as the repair of existing laboratories. Students undoubtedly need laboratories if they are to practice science; however, many teachers will need training in order to use new equipment.

Improving curricula and bringing technology into schools where teachers are not prepared to use them will create massive training needs which will require attention and funds. For example, local districts will need help in acquiring, maintaining, and using new equipment appropriately. National research and development activities should be conducted to help local school districts evaluate their success in training inservice teachers to use new curricula and equipment.

Teacher Education

If the public school curriculum is to be improved, then careful attention must be paid to the teacher education curriculum and funds need to be invested (as Lanier and Porter suggested) to study the relationship between knowledge of mathematics and science and classroom teaching. We need to know the content of teacher education programs if such programs are to be evaluated and improved. Unfortunately, we have a paucity of reliable information about how teacher education programs affect teachers' beliefs, knowledge and skills and how short-term training influences long-term teaching performance.

Although some teacher education programs are helping teachers learn about and utilize technology (computers, video simulation, etc.), we suspect that many are not. Teacher education institutions face complex decisons as they attempt to allocate scarce resources. For example, they must decide whether teachers should be familiar with computer simulations or be able to design simulations. That is, should teachers merely know where to obtain computer software or should they know how to improve inadequate software themselves?

Another important issue which teacher education institutions must address concerns whether elementary teachers should be trained as generalists (as most currently are) or as specialists. In order to possess a thorough knowledge of subject matter in any area, multiple, diverse curriculum materials and relevant instructional techniques, elementary teachers may need to be trained as specialists. Such training may be especially necessary for effectively teaching a subject such as science, where new information and developments occur rapidly.

It seems to us that some federal support and subsequent research (guided by agencies like the National Institute of Education and the National Science Foundation) could help to indicate in more detail how scarce resources can be used advantageously in teacher education programs. It would be pointless and wasteful for each school district to develop its own curricula and programs for improving the technologically-related skills of teachers and students.

Classroom Research

Clarification of curriculum goals in mathematics and science should make possible _focused_ but _comprehensive_ research on instruction in important topics in mathematics and science. To obtain curriculum goals, however, it will be necessary to conduct basic research on classroom processes related to these goals. In this section we will describe an important but neglected curriculum area in mathematics, problem solving. This discussion illustrates why research is desirable if improvements are to be made in classroom instruction and in learning.

In a recent examination of much of the mathematics education literature, we found many statements concerning how problem solving should be taught; however, we found no careful analyses of classroom instruction in problem solving. There are critiques of textbooks and critical and insightful examinations of student performance. Indeed, some of the research illustrating that students can answer mathematical problems correctly without understanding them is quite important and intriguing. Still, it is curious that nowhere in the literature can we find statements describing what takes place when teachers teach problem solving. How do classroom teachers define problem solving and how do they attempt to teach it? How much time is spent on problem solving? At present, there are no dependable data with which to answer such questions. It seems to us that if one wants to improve the mathematical problem-solving ability of students in American classrooms, these questions must be answered.

Thus, mathematics educators should conduct observational studies of classrooms during instruction in problem solving, particularly in classrooms of teachers who are especially adept at teaching problem solving. There are both theoretical, conceptual and empirical reasons for conducting such studies. Polya (1966) notes that solving problems is very much a practical art and, like swimming or playing the piano, it can be learned only by imitation and practice. He suggests that in order to become a problem solver, one has to solve problems. He points out that one of the ways students can become more skilled at problem solving is by having active teachers who can demonstrate the process by formulating choices carefully and can illustrate ways in which to deal with proposed problems. We realize that there are many alternative ways to characterize problem solving; however, Polya's emphasis is plausible and provides a rationale for examining ongoing classroom instruction.

Similarly, it appears that students are deficient in other important mathematical areas. Such "problems" can also be remedied through careful observation and experimentation (for some recent work on estimation skills, see Reys and Bestgen, 1981).

There is ample documentation from the mid 1970's and early 1980's that we can gain valuable information by studying competent teachers. Several extensive research programs funded by the National Institute of Education provide observational evidence that teachers vary in how they think, act and use time in the classroom. Furthermore, these variations among teachers have been related to student achievement in several field experiments (see Gage 1983; Brophy 1979, 1983; and Good, Grouws, and Ebmeier 1983).

We know considerably more about classroom teaching than we did a decade ago. In 1973, our information about the effects of classroom conditions on student achievement was weak and contradictory. In the ensuing ten years research (much of it influenced by funds and coordination from the National Institute of Education) on basic skill instruction, especially in reading and mathematics, has moved from a state of confusion to a point where several successful experiments have been conducted. These studies, in contrast to less sophisticated and often methodologically flawed research that took place in the past, illustrate that teacher behavior can significantly affect student achievement.

Furthermore, there is evidence that the skills effective teachers use can be taught to other teachers. In building a program of *active mathematics teaching*, Good and Grouws (1979) began by *observing* how more and less effective teachers (using student performance as the operational definition of effectiveness) taught. We combined this information with other research in order to build a teaching program that could be tested in intact classrooms. Findings showed that the program had a positive impact on student learning and that most teachers could implement the program without much difficulty. We felt that too much mathematics work in elementary schools involves a brief teacher presentation and a long period of seatwork. Such brief explanations before seatwork do not allow for meaningful and successful practice of concepts that have been taught; and the conditions necessary for students to discover or use principles on their own are also lacking. The program helped some teachers to overcome these problems.

The argument here is that much can be learned from the serious study of practice. As Flowers, Lanier and Kelly noted, many myths about educational practice exist, in part because we possess few data with which to describe practice. What data we do have indicate that teaching practice is much more varied than most people currently believe and hence, simple, generalized recommendations (e.g., increase time on task) will do more harm than good. Some participants at this conference suggested that teachers need to talk less and let students do more science. However, in many classrooms, teachers hardly talk at all and students are left to complete dismal "science" worksheets. In such classrooms, teachers should talk more (about the meaning of science; the concepts being studied) and students do not need to do more science, but a different science. Curriculum reform without descriptive research is, in our opinion, self-defeating.

Although much recent research examines basic-skill instruction, there is reason to believe that other processes could be effectively studied by the observation-development-field experiment research approach described above. If goals of curriculum reform and key concepts are identified, research could be directed at these areas.

The focus of such future work should not be limited to teachers. A similar observational model for understanding mathematics learning has been used by Krutetskii (1976) to study how excellent students attempt to learn mathematics. Also, as noted earlier, a growing number of researchers are interested in student behavior (e.g., time on task) and perceptions (Do they view problem-solving assignments as a challenge?), and such work can help to make instruction more effective (see for example, Peterson & Swing, 1982; Weinstein, 1983).

Many strategies for promoting effective learning are not common aspects of classroom practice and thus the study of practice is not the only way to bring about desirable change. For example, Rosenshine (1983) demonstrates that successful school programs can be achieved through systematic thinking and development independent of sustained observation of teachers.

Our purpose here is not to identify research areas, questions or paradigms that merit support. We do wish to suggest a general direction which we believe some future research should take.

Past research has been aimed at the curriculum, *or* teachers, *or* students. As we stated earlier, if research is to be effective, its content must be focused. However, within the particulars of a given research study (e.g., middle school science classes), research needs to become more comprehensive. We need to know the concepts and *subject matter* issues that are being studied as well as how *teachers* and *students* think and behave when they study particular concepts. Furthermore, curriculum research tends to examine content, sequence, and pace issues and to ignore what teachers and students do when they actually *study* curriculum.

We also believe that teachers and students need better science textbooks and teachers need manuals to help them understand the concepts and processes they teach. Without better materials and better illustrations of effective teaching/learning environments, students' scientific literacy will not improve.

More complete theories of instruction in mathematics and science (and of instruction generally) must also be developed. Lee Shulman suggested at this conference that there should be more structure to classroom instruction, and that students' understanding and knowledge of a subject should accumulate and develop over time. According to Shulman, the last short story taught in an English class or the last unit in an algebra course should be taught/learned somewhat differently than the first material, because students hopefully have learned concepts, principles and procedures for analyzing stories and problems. However, we have no instructional theories which enable us to examine these issues and little extant empirical data upon which to build such theories. As Bruner (1966) noted, a theory of instruction needs to describe the ways in which knowledge and concepts can be effectively sequenced so that students' understanding of instruction is enhanced.

Recognition of Teachers

In a variety of ways conference participants expressed their belief that teachers need more pay, recognition, public support and better working conditions. We agree. Many teachers have difficult jobs, are poorly paid and are frequently the targets of societal criticism. However, we must recognize that there is variation among teachers. Unfortunately, educators, researchers, the public and even teachers suggest that most teachers behave alike and have similar effects (whether positive or negative) on students. For example, some conference participants suggested that teachers are not capable of modeling problem-solving strategies, and other researchers indicated that most teachers teach mathematics in the same unproductive fashion. Others suggested that the study of teacher behavior has been unproductive and recommend that research address other areas. We submit that these generalizations about teachers and teaching often result from the failure to recognize variations in teaching performance. In reality, some teachers are worthy of emulation and others are not; some offer exciting, productive classrooms and others' classrooms are poorly organized and taught, and little productive learning occurs.

Because of society's failure to recognize and to reward satisfactorily competent teachers, many teachers (particularly the best ones) have left teaching. They do not want to work at an occupation that has low pay, little intellectual stimulation and little opportunity for advancement. As Wimpelberg and King (1983) state, "To endure the conditions accompanying life as a teacher, the person must have elaborate support systems, unusually high commitment to the roles and tasks of the job, or--on the negative side--no real occupational alternatives." Many conference participants pointed out that teacher salaries (especially those of experienced teachers) are too low and that teachers continue to obtain salary increments that are considerably less than those of other white-collar workers. There appears to be widespread and growing dissatisfaction among teachers with their pay and professional status.

Schlechty and Vance (1983) present data which indicate that too many of the most effective teachers are leaving the profession and that many students with higher aptitudes no longer enter teacher education programs. Despite evidence that the pool of bright students seeking enrollment in teacher education programs is declining, some teacher education programs still attract qualified candidates. For example, at the University of Missouri, students who enter the teacher education program rank at the 70th percentile of their high school classes (this figure has remained stable for 10 years).

Though we face a serious problem at present, it is still a solvable one. However, after another two to five years of neglect (particularly of the salary issue) and the loss of a higher percentage of capable teachers, the situation may become unmanageable. Because of a decline in the overall quality of teachers, it is more difficult for an individual teacher to be effective. Furthermore, because of increased public concern over the performance of public schools, there is a growing unwillingness to fund public education.

There is much that can and should be corrected in many teacher education programs and in public schools. Besides increased pay, there are other ways in which teachers can be compensated. For example, more documentation of teachers' preferences concerning the conditions and professional duties associated with teaching would be useful. Among the many options that could be used to improve teaching conditions: summer employment opportunities in business or industry; reducing record keeping and other clerical duties; three to four hours a week during the school day for planning; release time to observe other teachers, discuss instructional strategies and view classroom films with other teachers; the chance to specialize (Why should elementary school teachers be asked to be knowledgeable in several subjects?); helping educators and researchers to develop curricula; free college tuition for computer and science classes; more involvement by college and business personnel in actual classroom instruction and preparation of learning aids. Although most current legislation is intended to encourage persons to become mathematics and science teachers, the conditions of teaching must be altered so it becomes a more challenging, interesting occupation. We are especially encouraged by proposals that advocate bringing non-teachers to the classroom to share knowledge and expertise.

In the final section of the paper, we would like to discuss a salary plan that has received considerable attention, and the possibility of national study and development to help guide local school districts in devising salary plans and allocating resources.

Master Teacher

We have suggested many ways in which teaching can be made more attractive and prestigious: serious study of teachers; the sharing of teachers' successes with the public; raising salaries; improving working conditions; and altering teachers' duties (role). Yet another way to improve teachers' morale and classroom performance and thus to attract more talented persons to teaching is to identify and reward exceptional teachers.

Teachers who achieve excellence in classroom instruction, curriculum development, and supervision and training of other teachers should be identified and rewarded. Unfortunately, teachers who have taught for seven to ten years and who have similar training receive similar compensation, irrespective of whether they work 35 hours a week and perform dismally in the classroom or work 75 hours a week and perform superbly. The reward structure of teaching is flat (unstaged) and salaries are usually based on years of classroom teaching and the number of post-graduate courses completed. There is little opportunity for advancement, and most teachers reach the apex of the salary schedule in about 15 years. At the conference, Terrel Bell, Secretary of the Department of Education, also advocated increased pay for master teachers.

However, the potential advantages of a Master Teacher plan are not assured, and all incentive plans have problems. Participants at this conference argued that the problem facing American Schools was a decline in general teacher morale and that this problem needs attention if the teacher shortage in mathematics and science is to be remedied. The present pay of average teachers is much too low, and if funds for master teachers' salary increases come at the expense of upgrading teachers' salaries generally (a common teacher objection to this plan), general teacher morale is likely to be negatively affected. However, most differential pay plans proposed to date require that funds be added to educational budgets; money is not being taken from some teachers to pay others. To the extent that funds for master teachers are part of a plan to increase the salaries of all teachers (at least to some degree), this is an encouraging strategy to explore.

Others argue that decisions about who should be designated master teachers will cause dissension among teachers. First, many teachers believe they are outstanding teachers and will be disappointed when not selected as master teachers. Furthermore, some fear that the criteria for selection will relate more to political savvy than to teaching skill or subject matter knowledge. However, the obvious fact that reliable criteria will be difficult to establish does not mean that we should not try to define levels or stages of professional advancement in teaching. We must be certain, though, to define the criteria carefully, revise and review such criteria periodically and seriously study related issues (who sets the criteria, how judgments are actually made) if such plans are to work.

While rewards for teachers are important, a large measure of the value of such a plan lies in the discussion it encourages about what constitutes excellence in teaching as citizens, public officials, teachers and teacher educators debate this issue. A focus on excellence in teaching would help to identify positive aspects of schooling and enable the public to become more aware of the complexities of teaching. An increased public awareness might lead to greater gains for all teachers (i.e., an increased public willingness to fund higher salaries). Further, master teacher plans could add to our knowledge of classroom practice and increase our capacity to illustrate to other teachers strategies that are particularly interesting or effective. For example, master teachers could use videotapes of their classroom performance, curriculum units they have developed or students' products in order to assist in the training of other teachers.

We suspect that master teacher plans will have more effects in some school districts than in others and that in too many cases funds will be spent in ways that will not encourage or reward competent teachers. Many plans address the improvement of teaching generally and the need for master teachers (see for example, Schlechty and Vance, 1983). However, an immediate attempt to identify and examine issues and problems associated with the implementation of master teacher plans and alternative ways of responding to these problems would involve money well spent to provide important technical and conceptual support to local school districts. Although local districts need to identify and to reward those school processes and products that they value, it seems a waste to require every school district to address a number of sophisticated technical questions that require the attention of economists, psychologists (How much money is necessary for real incentive?), sociologists (How can the potentially divisive effects of competition be minimized? How should career ladders be structured?), as well as classroom researchers, subject matter specialists and measurement specialists. If the plan is to work, serious conceptual study must occur. It will probably be necessary to define several stages in the teaching career ladder (each involving extra compensation) toward the final status of a master teacher. At each stage teachers' professional duties could expand to include curriculum development, assisting with research and supervision and training of other teachers.

Conclusion

The shortage of qualified mathematics and science teachers is an important problem that merits immediate expenditures and action. There is considerable evidence that science is infrequently taught in elementary schools (e.g., Ebmeier and Ziomek, 1983). Furthermore, participants at this conference generally agreed that instruction in mathematics and science is often inadequate, however, because of a lack of research in this area, few participants described specific changes which are needed. Not only do we need more and better qualified teachers, we must also have improved curricula, textbooks, instructional theories and procedures for making mathematics and science more meaningful. Although it may be appropriate that some additional time should be spent on mathematics and science instruction, the quality of the curriculum and the quality of teaching should be our most important concern.

Before science and mathematics curricula and instruction are altered effectively, however, educators, researchers, mathematicians, citizens and teachers must comprehensively assess the curriculum and instruction currently offered in American schools in order to make intelligent decisions about changes which are necessary. This is because we not only need citizens who are scientifically literate, but citizens must also have a sense of history, the ability to express themselves and an appreciation of and skills necessary for participating in the democratic process, etc.

It is clear that the entire American public school curriculum needs serious study. We believe that many courses in the present curriculum are unneeded and that evaluation and reform of general curricula are necessary steps if we are to take appropriate actions in reforming mathematics and science curricula.

Long-term solutions are possible and funds should be invested in national research and development. The problems related to curricula, teacher shortages, technology and instruction are general ones. Local school districts currently have limited options for addressing such issues (e.g., they can choose among poor curriculum series). However, state and local districts can utilize the results of national research and development to examine more alternatives and criteria for making decisions about improving curriculum and instruction.

Education Finance in the States: 1984

Report No. F84-1

by
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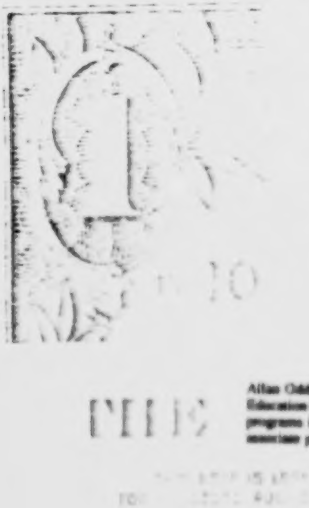
June 1984



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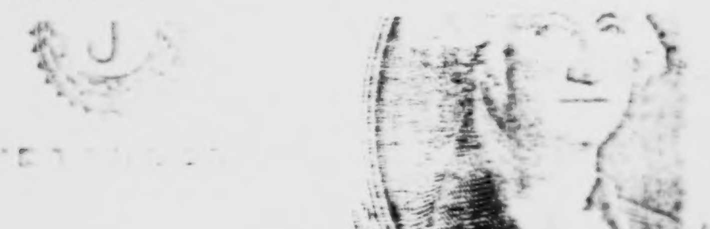

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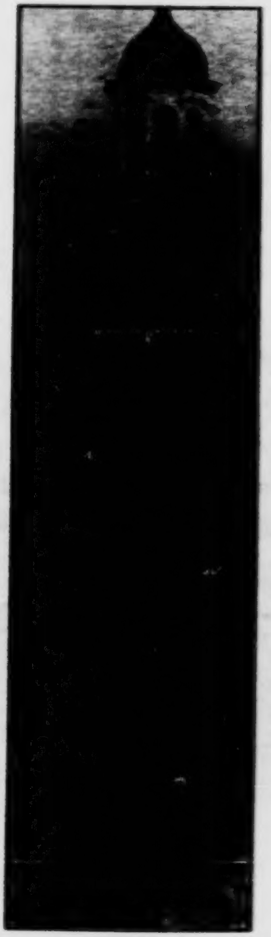


The catalyst for education reform in the 1980s was the release of *A Nation at Risk* and several other reports calling for improvements in America's public schools. By the end of 1984, at least eight states will have passed comprehensive education reform programs, six of them funded largely by increases in state sales tax rates. Other states will debate education reform packages in 1985; many are likely to pass. The victim of inattention in the late 1970s and early 1980s, education quickly became a top state policy concern deserving infusions of new tax dollars.

Accompanying the new interest in excellence has been continuing interest in equity. Most new state dollars are allocated to local districts through school finance formulas; funding also has increased for special populations. Furthermore, education excellence programs have strengthened and revamped school finance formulas in a number of states. Although the education reform measures carry the total education packages through the legislative process, it seems that states are addressing equity and excellence simultaneously.

The education reform movement has changed the substance of education policy. New dollars are targeted to specific education initiatives — merit pay or career ladders for teachers, longer school days or years, more mathematics and science courses, more writing assignments, new programs for at-risk, preschool children. State policy now reaches inside schools and classrooms, which raises new and important issues of allocations. The allocation and use of instructional time, curricular content and student access to good teachers all have fiscal implications that so far have received little attention in school finance policy.

Other issues besides education reform are broadening the school finance agenda. Access to and the use of computers differ between high-spending and low-spending districts, in part because of basic school finance inequities. The growing use of sales taxes to finance education excellence is increasing the regressivity of state and local taxes. The emergence of local education foundations, the expansion of fee-for-service activities and the proliferation of business-school partnerships are changing both the finance and governance of schools. Pension costs pose a long-term fiscal problem in most states, and system incentives that reward outstanding teachers, students or schools raise new issues not handled well by traditional school finance formulas.

The strength of a state-level education reform movement depends considerably on state fiscal health, which is good in mid-1984. More budgets are balanced, and fund balances are rising. The public's concern about the quality of education and its willingness to pay for quality even makes tax increases politically feasible in many states. But state fiscal health is threatened by continuing large federal deficits, and even states that increase taxes produce too little new revenue to finance improvements fully. A continued strong economy and development of less expensive ways to meet the goals of education excellence seem essential to the continuing success of education reform.

States Respond to Education Reform

Quickly and unpredictably, education became big news in 1984 and moved back to the top of most state policy agendas. Fiscal attention is being lavished on education in a manner unrivaled since the school finance reforms of the early 1970s.

In the late 1970s, legislative leaders began switching their attention from education to other issues, and new legislators avoided assignment to education committees (Rosenthal and Fuhrman, 1981). Experts predicted that public education would do well to maintain its revenue base in real terms over the 1980s (Garms and Kirst, 1980), and in the first three years of the decade, real revenues fell significantly (Odden, McGuire and Belsches-Simmons, 1983). In early 1983, few experts suggested a turnaround was just around the corner.

But with the April 1983 release of *A Nation at Risk* by the National Commission on Excellence in Education and *Action for Excellence* by the Education Commission of the States' Task Force on Education for Economic Growth, and with the subsequent release of other studies, education became a top priority. The President of the United States crisscrossed the country during the summer of 1983 speaking on education. Governors proposed major education reform programs in state-of-the-state messages. The business community — nationally and in many states — launched studies of public education, an area business had not addressed substantively for many years.

State response was rapid and substantial. In the last nine months of 1983, more than 250 new education task forces were charged with the responsibility to develop education reform programs. Even before the task forces were formed, many states had undertaken school improvement activities (Odden and Dougherty, 1982) drawing largely on the literature on effective teaching and schools (Cohen, 1983). By the end of the 1983, Arkansas, Florida and California had passed major education reform bills. Illinois, Florida and California had enacted master teacher bills. Reform programs were proposed in many other legislatures in 1984, and a survey of state legislators by the National Conference of State Legislatures showed that education would be the top budget issue in nearly two-thirds of the states responding.

Common to all this activity is strong interest in improving American public education — in restoring it to a position of excellence both nationally and internationally. Put differently, the issue in 1984 is education excellence, not the equity and access issues that have been on agendas for the past 15 years. The fiscal issue is not school finance reform, but raising money to finance education excellence — even though the concern for excellence arose at a time when the country was in its deepest recession since the 1930s.

The interest in education reform raises new issues for school finance. What are the short-, medium- and long-run costs of various reforms? How should these costs be calculated, and are necessary data and techniques available? Who should fund education excellence initiatives — the state, the school district, or both? How should new funds be allocated — through the school finance fiscal equalization formula, a separate equalization formula, flat grants? How should state dollars be divided between the school finance formula and traditional categorical programs — the old equity issues — and the education reform initiatives — the new excellence issues?

This new booklet begins to unravel the answers to some of these tough, new questions. It is based on a study of how eight states have dealt with education reform. All eight have either enacted comprehensive education reform or are in the process of doing so.

The booklet has four sections. The first section discusses the changing state fiscal and political contexts within which reforms are being debated. Section 2 briefly describes reform packages and their costs in Arkansas, California, Florida, Illinois, South Carolina, Tennessee, Texas and Utah. Section 3 compares and contrasts the treatment by these eight states of specific elements of reform and analyzes cost, finance and allocation implications. The fourth section summarizes the new school finance issues flowing from the reforms described in Section 3 and also other finance issues that are part of broader social and economic changes across the country.

★

1. The Changing Fiscal and Political Context

Education funding, school finance and the politics of education shape — and are shaped by — a broader economic and political context. This section provides a brief overview of the fiscal condition of education in mid-1984, the fiscal condition of the states and public opinion about the schools and education reform.

* * *

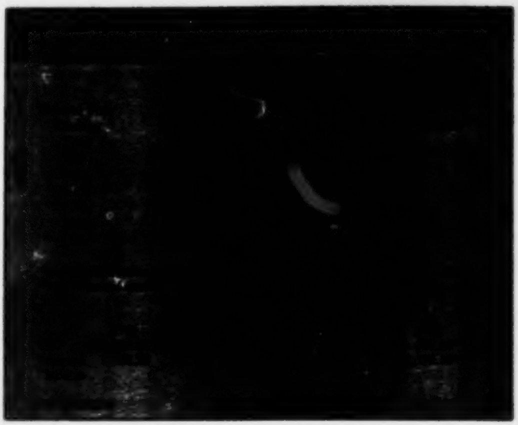
The Fiscal Condition of Education

In the 1970s, the fiscal condition of public education improved significantly. Total revenues increased, expenditures per pupil rose in real terms and teacher-pupil ratios slowly but steadily increased. Spending for public education consumed a relatively constant percentage of personal income and gross national product (GNP).

At the beginning of the 1980s, funding for education began to decline. But as Table 1 shows, revenues now are starting to rise again, or at least to stabilize. Total school revenues, which had represented a constant 3.8% of the gross national product (GNP) between 1969 and 1979, dropped to 3.7% in 1980 and to 3.5% in 1981. In 1982, the GNP itself stagnated. Since then, school revenues have generally risen as a percentage of GNP, reaching 3.6% in 1982, 3.7% in 1983 and 3.6% in 1984. Total school revenues had equaled between 4.6 and 4.7% of personal income in the 1970s. This ratio dropped to a low of 4.3% in 1982 but now seems to be rising slightly, reaching 4.4% in both 1983 and 1984.

These rebounding trends are also reflected in Table 2, which presents total nominal and real revenues for education, and revenues by source, from 1969 to 1984. The data are quite striking. Total revenues, which had increased in real terms from $69.1 to $87.4 billion in the 1970s, dropped in real terms in the first three years of this decade. But in 1983, substantially increased state and local support brought total revenues to $88.1 billion in real terms, the highest figure in history. The upward trend continues in 1984; the estimates shown in Table 2 may even be too low, because more education reform programs may be enacted before year's end. Although the $7.3 billion hike in local revenues (mainly property taxes) between 1982 and 1983 contributed substantially to rising revenues for education, overall increases are largely fueled by rising state support.

Table 3 shows the distribution of revenues for public schools by level of government. Note that the role of the state in providing school revenues generally continues to expand, although some fluctuation occurred during the last three years. Note, too, that the decrease in federal support (which has stayed the same in total dollars during the past two years, after dropping from 1982) has in part been offset by stronger local support (which jumped by 1.6% between 1982 and 1983, the first significant increase in more than a decade). If most of the money for education reform continues to come from state sources, state participation could soon exceed 50%. If a continuing rise in state support were combined with stable or rising federal support, it is also likely that local support will cease to rise. But this point is debatable.



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The declining contribution of property taxes to education in the 1970s and the rising contribution of state revenues, when combined with the fiscal limitations on state governments in the 1980s, lead some to suggest that the contribution of property taxes is likely to rise again in the 1980s (Augenblick, 1984). This prediction is consistent with the strong role property taxes historically have played in financing schools, and the inability of any state to eliminate the use of property taxes for schools as part of school finance reforms enacted last decade.

But Dick Netzer, one of the country's leading property tax experts, suggests that increased use of property taxes will be constrained by several factors (June 1983). First, high interest rates, which most experts consider a long-term reality, increase the cost of borrowing and decrease the price of property. Second, the shift from a goods-producing economy to one that produces services and information places less value on real goods. Both factors combine to limit increases in property value — the property tax base. In addition, claims Netzer, public dissatisfaction with local property taxes is still high, which makes raising property tax rates difficult. From a base that increases slowly and with little movement in rates, property taxes are unlikely to grow rapidly. Netzer's conclusions also are consistent with how increases in education funding have occurred in the last year — through major increases in state taxes, not in property taxes.

The data on per pupil expenditures shown in Table 4 also indicate that real revenue for education has stopped declining. Real expenditures per pupil dropped in 1980, but they have increased, slowly, in subsequent years. (Since the total number of pupils has decreased each year, the rise in expenditures per pupil is in part a statistical phenomenon, however.) Predicting expenditures per pupil for the rest of the decade is difficult, since enrollments are expected to begin rising in 1985. For these expenditures to continue rising in real terms, the percentage increase in total revenues would have to exceed the sum of the percentage increase in pupils and the percentage rise in the consumer price index.

All in all, the current and near-term revenue situation for schools looks optimistic. But the picture may not be so rosy by the end of the decade, since there is uncertainty about state fiscal health.

★

Sources of Revenue
(Billions)

School Year Ending	Local		State		Federal		Total	
	Nominal	Real*	Nominal	Real*	Nominal	Real*	Nominal	Real*
1969	$18.3	$36.4	$13.9	$27.6	$2.6	$5.2	$34.8	$69.1
1979	38.1	38.1	41.1	41.1	8.2	8.2	87.4	87.4
1980	39.9	35.3	46.5	41.1	8.7	7.7	95.1	84.0
1981	42.9	34.2	50.2	40.0	8.7	6.9	101.8	80.8
1982	47.3	35.4	53.8	40.3	8.9	6.7	110.1	82.5
1983	53.8	39.5	58.3	42.6	8.2	6.0	120.4	88.1
1984	56.8	39.7	62.6	43.8	8.2	5.7	127.6	89.3

*Relative to 1979.

Consumer Price Index: July 1969 = 110.2, July 1979 = 218.9, July 1980 = 247.8, July 1981 = 274.4, July 1982 = 292.2, July 1983 = 299.3, July 1984 = 312.8 (est.).

Source of revenue figures: National Education Association, *Estimates of School Statistics*, selected years.

The Fiscal Condition of the States

One reason the fiscal condition of education seems healthy, at least for the short term, is that the fiscal condition of the states has improved significantly. As Table 5 shows, fewer states are likely to end fiscal year 1984 with a fund balance less than 5% (the conventional standard) than did so in 1983. Moreover, most states that will have a fund balance below that standard will have a larger percentage balance than they had in 1983. Whereas eight states ended 1983 with a deficit, only three projected deficits in 1984; in all three instances, a tax increase could prevent the deficit.

Three major factors explain the improvement in state fiscal conditions. First, states were diligent in cutting appropriations to bring spending closer to revenues. Second, states enacted tax increases in 1982 and 1983 to bolster revenues; in fact, in 1983 states raised taxes by $8.25 billion, the largest amount in history. Third, the improving national economy helped expand revenues produced by natural growth.

However, as Gold and Eckl (1984) show, fiscal conditions vary tremendously by state and over time. Conditions have not improved in a number of states, and the ability of states to raise taxes is limited. In Michigan, for example, many legislators who had voted for a tax increase were removed from office by public initiative. Ohio had a tough challenge voting down a ballot measure to rescind its tax increases. An initative to roll back tax increases in Florida was thrown off the ballot, but only on technicalities.

Also clouding the outlook are large federal deficits, which many experts feel threaten the growth of the national economy and therefore of state economies as well. Many economists think economic growth will continue only if federal deficits are reduced significantly each year for the rest of the decade.

As a result, predicting the fiscal outlook for education is difficult. Gold and Benker (1983) have shown that states cut education budgets less than other budgets when they had to reduce expenditures and increased appropriations to education more than to other areas when fiscal conditions improved. But only if states remain fiscally healthy in general will education finances improve significantly.

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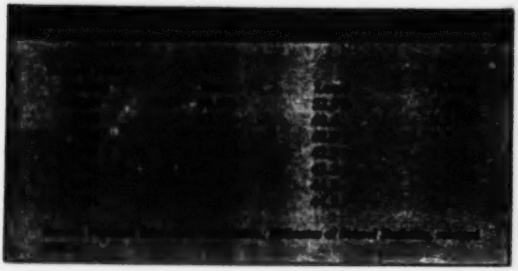

Table 5. State Year-End Balances as a Percentage of General Fund Expenditures ★

State	1978	1979	1980	1981	1982	1983	1984*
Alabama	6.7	1.4	1.2	4.1	3.8	0.5	7.0
Alaska	58.4	60.8	188.2	23.6	3.9	2.1	10.6
Arizona	3.1	11.0	19.7	8.9	2.8	0.0	0.1
Arkansas	0.0	0.0	0.1	1.9	0.0	0.7	0.0
California	31.0	16.5	13.7	1.7	1.1	–2.7	1.7
Colorado	10.3	15.1	21.5	4.1	2.3	0.0	3.4
Connecticut	4.9	N.A.	N.A.	–2.4	–1.7	–1.4	0.6
Delaware	5.1	8.9	6.8	8.2	5.9	7.1	9.0
Florida	4.2	7.9	17.6	0.6	5.4	2.0	2.6
Georgia	6.0	3.9	5.8	1.8	2.5	0.6	0.0
Hawaii	0.3	7.5	18.3	17.0	11.6	9.5	4.2
Idaho	0.0	3.2	1.9	0.4	0.0	0.0	4.4
Illinois	1.3	5.8	5.2	2.4	2.3	1.3	1.2
Indiana	1.4	18.7	10.7	1.3	2.6	2.8	4.7
Iowa	7.4	5.8	1.8	1.8	0.8	0.4	–4.5
Kansas	18.4	20.3	16.5	12.1	10.2	3.6	1.4
Kentucky	5.8	4.6	0.8	0.6	1.0	1.5	0.2
Louisiana	1.6	15.1	19.3	14.8	8.8	4.6	0.0
Maine	8.4	5.5	3.6	4.3	2.8	3.2	3.0
Maryland	9.2	5.5	11.2	5.3	4.9	1.0	0.0
Massachusetts	5.5	5.6	1.1	0.5	1.6	1.3	0.4
Michigan	0.6	0.7	0.0	0.0	N.A.	0.5	4.2
Minnesota	1.0	7.8	3.4	–0.1	–14.5	1.1	4.1
Mississippi	13.7	8.1	6.2	7.0	2.9	1.2	0.0
Missouri	9.4	20.5	13.7	4.9	4.3	2.4	3.5
Montana	15.4	12.0	17.8	23.4	17.6	17.6	7.5
Nebraska	6.2	11.9	20.3	8.8	0.0	–0.5	5.8
Nevada	N.A.	26.6	18.6	11.4	10.4	20.3	12.0
New Hampshire	11.3	13.2	3.9	–11.0	–2.4	–12.5	–9.2
New Jersey	7.0	4.9	5.9	3.8	2.0	2.2	3.4
New Mexico	13.0	6.4	16.6	18.6	7.5	12.0	10.8
New York	0.1	0.1	0.1	0.1	0.0	–0.3	0.3
North Carolina	8.5	7.6	10.4	4.9	3.3	2.0	0.4
North Dakota	73.3	49.8	53.2	49.9	25.1	5.1	3.7
Ohio	3.2	9.2	3.4	0.2	deficit	0.9	0.8
Oklahoma	10.8	13.4	5.6	27.1	7.4	1.7	N.A.
Oregon	20.7	12.9	6.7	0.8	deficit	0.8	1.1
Pennsylvania	–0.1	0.5	1.1	1.1	0.0	–3.1	0.0
Rhode Island	3.7	6.9	5.2	4.1	0.0	0.4	0.7
South Carolina	4.3	1.0	3.2	0.0	0.0	0.5	1.1
South Dakota	5.2	5.6	7.3	8.9	3.7	6.7	9.9
Tennessee	0.0	0.3	4.9	1.9	1.3	0.4	2.7
Texas	20.2	17.9	10.7	20.0	N.A.	11.4	0.2
Utah	4.1	2.5	1.2	5.9	1.7	1.2	1.0
Vermont	2.5	0.0	–3.1	–0.5	0.0	–9.5	–13.2
Virginia	1.9	5.7	14.1	11.0	1.7	3.3	1.5
Washington	10.6	14.8	4.6	0.1	deficit	1.1	0.7
West Virginia	5.9	4.9	7.9	0.8	–0.6	0.0	2.1
Wisconsin	9.0	9.0	2.2	0.7	1.9	–4.4	9.1
Wyoming	30.0	69.9	70.0	30.3	26.4	51.4	10.4

*Estimated January/February 1984.

N.A. = not available.

Source: Steven D. Gold and Corina L. Eckl, unpublished data from the National Conference of State Legislatures (Denver, Colorado, February 1984).

Public Opinion

Robert Teeter, a national pollster for Republican candidates, and Peter Hart, a pollster for Democratic candidates, have suggested that public concern for education rose in the 1980s even before the release of major national reports on education in early 1983. In an analysis of polling data presented at the 1983 annual meeting of the Education Commission of the States, they both pointed out that the public felt the quality of education had worsened and improvements were needed in education and student performance. To some degree, they implied, the national reports merely articulated and made urgent what was already a public concern.

According to the Gallup polls, the public has generally given the nation's schools lower and lower grades over the past decade. Although the percentage of respondents giving schools an A or B has stayed about the same during the past few years (see Table 6), Gallup data indicate that the public feels improving the schools has high priority.

Polling data in many states suggest that the public strongly supports education reform. In a 1983 Tennessee survey of voters' attitudes toward public education, 67% of those polled said the state should spend more money to improve public education, even if it meant increasing taxes. In Utah, a 1983 survey conducted for the Governor's Steering Committee on Education Reform found that 71% of respondents would favor a tax increase to provide more money for public schools. A survey in South Carolina showed 83% of respondents agreeing that the state must spend more money on public schools; 62% agreed that the best way to raise more money was through a one-cent sales tax increase; and 75% said they would vote for legislators who voted for higher taxes to improve the schools. In North Carolina, 77% of those polled said they would pay more for public education.

The polling data — in the main — suggest the public is firmly behind state government attempts to restore excellence to all public schools, even if it means tax hikes.

But while the public supports increased funding that is linked to education reform, it also will expect the reforms to produce results, i.e., to raise student achievement and improve the schools. Evidence on the efficacy of school reforms likely will be needed to sustain public support for school reform. Since it takes time for new programs to impact student achievement, state policy makers in the short term will need to document progress. By the end of the decade, student achievement will need to improve to solidify support for reform.

In summary, the fiscal and political context of education in 1984 is markedly different than in the early 1980s. The fiscal condition of education has improved noticeably since the beginning of the decade, as economic conditions have improved in most states and the nation, and as national reports have bolstered interest in education. Clouding the outlook for continuing fiscal improvement is the possibility that a large federal deficit may slow economic recovery. But public interest in improving education is strong in many states, and many voters seem willing to pay for improvements by raising taxes.

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Table 6. Public [illegible]

Grade Given to Public Schools	Percent of Those Polled						
	1974	1977	1979	1980	1981	1982	1983
A	18%	11%	8%	10%	9%	8%	6%
B	30	26	26	25	27	29	25
C	21	28	30	29	34	33	32
D	6	11	11	12	13	14	13
F	5	5	7	6	7	5	7

Source: George Gallup, "Gallup Poll of the Public's Attitudes Toward the Public Schools," *Phi Delta Kappan*, vol. 65, no. 1 (September 1983), pp. 33–47.

2. Education Reform in Eight States

Nearly all states are involved in education reform, but some states have capitalized on improvements in state fiscal conditions with particular speed. Arkansas, California and Florida enacted major reforms in 1983; South Carolina, Tennessee and Utah enacted reforms in early 1984. Texas called a special session of the legislature in mid-1984 to address education reform, and Illinois, which will wait until 1985 to address education comprehensively, established a small master teacher program in 1983. This section discusses the major elements of the new education programs in these eight states.

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Arkansas

In a special session in late 1983, the Arkansas legislature passed a major education reform package funded mainly by a one-cent increase in the sales tax. To raise the quality of public education, educational standards have been strengthened and the school finance formula has been redesigned.

Arkansas historically has ranked very low in expenditures per pupil. Expenditures per pupil in 1983–84 were estimated at $2,151, which put Arkansas in 46th place nationally. Revenues for its 420,000 pupils totaled $327 million from the state, $321 million from local districts and $121 million from the federal government. The average teacher's salary of $16,929 ranked 48th nationally.

One impetus for education reform was a 1982 ruling by the Arkansas Supreme Court that the school finance structure violated the state constitution. In response to the ruling, former Governor White appointed a task force to design school finance alternatives for submission to the 1983 legislature. White was defeated in the 1982 elections by Bill Clinton, a strong advocate of improving education to spur economic growth. At the urging of Governor Clinton, the legislature in 1983 passed the Quality Education Act, which called for creating a State Standards Commission to set new standards for Arkansas public schools. Clinton appointed his wife as chairman of the commission. Together they developed a strategy to link higher standards for education with school finance reform, and they also launched a large public outreach program to encourage support for increasing taxes to fund a major education reform.

In late 1983, the legislature passed a significant education reform package. In early 1984, the Standards Committee made final recommendations for new standards. Combined, the programs include the following major elements.

- Requirements for high school graduation raised from 16 to 20 courses
- Maximum class size reduced to 23 in elementary grades
- School year lengthened from 175 to 180 days
- Minimum school day lengthened from 5 hours to 5.5 hours
- Contract for teachers lengthened from 180 to 190 days
- Curriculum strengthened in many areas, including mathematics and science
- Minimum competency testing of students in grades 3, 6 and 8. (Eighth-grade students must pass this test to be promoted into high school.)
- Testing of teachers. (Teachers who do not pass may be fired.)
- Six-year school improvement plans required from all school districts. (Progress reports are to be provided annually at local public hearings, and the state is to intervene if progress is insufficient.)
- Grants and scholarships to students, teachers and schools for outstanding performance
- School improvement programs to be implemented by the state education agency including:
  - — Classroom management
  - — Academy for administrators and school board members
  - — Effective schools program
  - — Training principals and teachers in reading instruction
  - — Training parents to be teachers at home
  - — Five new regional service units
- Major school finance reform. Dollars in the old minimum-foundation program, vocational and adult education, special education, elementary and secondary textbook funds, guidance funds and kindergarten funds are combined into a new pupil-weighted foundation program.

The program is funded by a simple one-cent increase in the sales tax (from three cents to four cents) that is now assumed sufficient to fund the programs and standards listed above. Districts are to implement the new standards in ways they consider appropriate, including the use of computers and cooperative programs across district lines. After the 1987 school year, progress and the adequacy of funding will be assessed.

Most of the new funds will be allocated to school districts through the new foundation formula, with the requirement that districts spend no less than 70% of new state dollars on raising teacher salaries or one-half of the money needed to raise salaries to the average of the surrounding states, whichever is less. In 1983–84, state aid through the new formula will increase by $68 million, from $378 million to $446 million, and to $526.5 million in 1985. Total state aid will increase from $479.7 million in 1982–83 to $674.6 million in 1984–85, a 41% increase of $194.5 million over two years. Since 116 of the 367 districts also must raise their property tax rates, local revenues will increase in nearly one-third of all districts. ★

California

In 1982, California elected a new governor and a chief state school officer who was interested in education reform. The 1983 legislative session produced a large-scale education reform package (SB 813) based on proposals put forth by a leading state senator, Assembly Democrats and the new chief state school officer. The 1984 legislature is adding numerous new elements to that program. This recent activity follows the passage of major school finance reforms in 1973, 1977 and 1978 (after Proposition 13), each of which included significant education reform elements.

Although California has long been a leader in school finance and education reform, it ranked 31st nationally in 1983–84 in current operating expenditures per pupil (estimated at $2,912). It has about four million students in average daily attendance. Revenues totaled $8.6 billion from the state, $3.4 billion from local districts (Proposition 13 limited the use of local property taxes for schools) and $885 million from the federal government. Average teacher salaries estimated at $26,403 put California in fifth place nationally.

SB 813, which ran to more than 200 pages, is difficult to summarize. The most well known programs are the following:

Strengthened Curriculum and Education Program

- Reinstated statewide high school graduation requirements and established "Golden State" tests to honor the best students at graduation (FY84 cost: nothing)
- Provided fiscal incentives to lengthen the school day or reinstate the six-period high school day
- Provided fiscal incentives (including total teacher pay) to local education agencies to lengthen the school year (FY85 cost for longer year and longer day: $256 million)
- Developed model curricula in critical content areas
- Expanded the school improvement program to make $100 per pupil available for all students in elementary grades (FY85 extra cost: $10 million)
- Provided a flat grant of $20 per pupil for counseling for all 10th-grade students to help each student outline a sound high school program (FY84 cost: $6 million)
- Mandated 150 hours of continuing education for all teachers every five years
- Increased textbook funds for grades K–8 and provided first-time textbook funding for grades 9–12 (FY84 cost: $36 million)

Incentives for Recruiting and Retaining Good Teachers

- ★ Increased beginning teacher salaries to $18,000, adjusted for inflation over three years (FY84 cost: $12 million)
- ★ Established a mentor teacher program that provides stipends of $4,000 for 5% of the teachers in a local education agency (FY84 cost [one-half year only]: $11 million; FY85 cost: $31 million)
- ★ Reinstated summer school (eliminated in 1978) in mathematics and science, which lets mathematics and science teachers earn more money (FY85 cost: $40 million)
- ★ Expanded regional teacher centers for staff development, including computer training (FY85 cost: $5 million)
- ★ Created a mini-grant loan program for teachers (FY85 cost: $18 million)

Changes in School Finance Formula

- ★ Simplified overall formula
- ★ Reduced the "squeeze" on high-spending districts, letting them increase expenditures at a faster rate
- ★ Brought low-spending districts to within $50 of the prior-year average for 1983–84 and to the actual prior-year average for 1984–85
- ★ Calculated revenue limits separately for elementary, high school and unified districts and made the increase a flat dollar amount (which provides a higher percentage for low-spending districts)

State aid increased by $800 million between 1982–83 and 1983–84, and it is projected to increase by $1.0–$1.3 billion for 1984–85. Large as $800 million is in absolute value, the increase turned out to be 8% for the school finance formula, 6% for the traditional categorical aids (with special education receiving an 8% hike), and (since enrollments rose by 40,000 students) 6.7% on a per-student basis. Funds for raising teacher salaries, lengthening school days and years, and other excellence initiatives are now being allocated each fiscal year. But state support for beginning teacher salaries will be eliminated after three years, and support for other programs will eventually be rolled into the school finance revenue-limit program.

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Florida

Florida, like California, has been a leader in school finance and education reform. In 1983, it was the first state to enact legislation to improve public education.

In 1983–84, Florida ranked 25th in the nation in current operating expenditures per pupil (estimated at $2,942). The state has 1,495,880 pupils in average daily membership. Revenues totaled $2.71 billion from the state, $1.86 billion from local districts and $400 million from the federal government. The average teacher salary was estimated at $19,545, 35th nationally.

Approved during a special session of the legislature in July 1983 was a plan that includes:

- ★ High school graduation requirements of 24 units, the highest in the country (FY84 cost: no separate cost, see "seventh period in high school" below)
- ★ Mathematics and science initiatives:
  - — science and computer equipment and labs (FY84 cost: $30 million)
  - — Seventh period in high school, for more mathematics and science courses (FY84 cost: $27 million)
  - — Summer inservice training institute (FY84 cost: $9.2 million)
- ★ Master teacher and career ladder program (FY84 cost: $17 million)
- ★ Writing program for grades 10, 11, 12 (FY84 cost: $20 million)
- ★ Increase of $252 million (12.7%) in combined state and local revenues for the basic school finance formula.

In total, state and local revenues grew by over $400 million, or $267 per child (an increase just over 9%), most of it allocated through the state's school finance program. The sources of new state funds are a new unitary tax on foreign income of corporations based in Florida and the sales tax increase from 4% to 5% enacted in 1982.

The reform momentum continues this year, and several new programs have been proposed for 1985:

- ★ A House-sponsored middle school bill that would mandate statewide curriculum requirements for grades 4–8 (FY85 appropriation: $2 million)
- ★ A Senate-sponsored "merit school" bill that would make extra funds available to schools judged meritorious on criteria including student achievement (FY85 estimated cost: $20 million for either local merit school or local merit pay plans)
- ★ A Senate-sponsored bill extending the 7th period day (FY85 cost: $67 million)

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Illinois

In 1983, Illinois enacted a "master teacher" program that awards 500 teachers a one-time bonus of $1,000 for curriculum development, inservice training and other functions of a master teacher. Since the average teacher salary in Illinois for 1983–84 is estimated at $23,345 (12th in the nation), the bonus equals just under 5%. Because the award is small and the number of recipients is limited to about one teacher for each 2 of more than 1,000 districts, the program is a modest step toward restructuring compensation for teachers.

Education reform in Illinois is slated for debate in the 1985 legislative session. Three major task forces will make proposals — a school finance committee established by the state board, a legislative education reform committee and a business-education task force. Four related issues will likely constitute the 1985 agenda: (1) school reform including higher school graduation requirements, teacher effectiveness and teacher salaries (including significant expansion of the master teacher program), effective schools and curricula; (2) school efficiency, perhaps based on the recommendations of the business/education task force and including school district consolidation; (3) fiscal equity/school finance reform based on a proposal to adopt the school finance formula to a resource cost model that identifies an education program for each district, totals the cost and then allocates state funds through a fiscal equalization formula; and (4) tax reform, including a permanent increase in the state income tax and a reduction of local property taxes.

The temporary state income tax increase enacted in 1983 to balance the budget will expire in June 1984, and no extensions will be proposed this year. Next year, however, there may be interest in making the increase permanent and using the proceeds to fund education and school finance reform and to reduce property taxes.

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South Carolina

South Carolina has been quietly active in education and finance reform for nearly a decade. It enacted a major school finance reform in 1977, initiated student testing programs the next year and, in 1984, passed a comprehensive education reform package funded primarily by a one-cent increase in the state sales tax.

Despite the influx of new dollars after 1977, public education expenditures have stayed low. Current expenditures for each of the state's 584,000 students in average daily membership are estimated at $2,305 for 1983–84, 44th in the nation. Revenues totaled $967 million from the state, $467 million from local districts and $196 million from the federal government. The average teacher salary is estimated at $17,500, 43rd in the nation.

In early 1983, the governor appointed the Task Force on Financing Excellence in Education. About the same time, the chief state school officer outlined a comprehensive education package to improve education. The governor then appointed the Partnership of Business, the Legislature and the Public Schools, which he chaired with the chief state school officer. The task force developed an education reform package, which the partnership reviewed. Both groups supported the final proposal, which the governor submitted to the legislature in November 1983.

The plan passed by the House, which closely resembles the proposal, includes 10 major components:

- ★ High school graduation requirements increased from 18 to 20 courses (FY85 cost: $5 million)
- ★ Mandatory kindergarten for all 5-year-olds and a preschool program for disadvantaged 4-year-olds (FY85 cost: $4.2 million)
- ★ Exit exam for high school graduation, grade promotion based on achievement and a state remedial program for grades 1–12 (FY85 cost: $59.0 million)
- ★ Programs for gifted and talented students (FY85 cost: $3.7 million)
- ★ Across-the-board salary increases for teachers, raising them to the Southeastern average, nearly 16% (FY85 cost: $59.5 million)
- ★ Incentive pay for teachers and administrators (two-year pilot; to be implemented in 1987 at a cost of $24 million)
- ★ Incentive grants for high performing schools (five-year phase-in, at a cost of $28 million in 1989)
- ★ Competitive grants for teachers, forgivable loans for prospective teachers and higher standards for admission to teacher training
- ★ Numerous school improvement programs administered by the state board
- ★ Changing the focus of the School Advisory Councils to school improvement and renaming them School Improvement Councils
- ★ Strengthened school finance formula (FY85 cost: $43 million)
- ★ Other program improvements (FY85 cost: $17 million)

Nearly $273 million, an increase in state aid of more than 27%, funds these reforms. The money will come from increasing the sales tax from 4% to 5% and natural growth in general fund revenues. Most of the new funds will be allocated through the pupil-weighted foundation program.

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Tennessee

In early 1983, before the appearance of national reports on education, the Tennessee Legislature considered "The Better Schools Program," which included a proposal for a career ladder that would fundamentally restructure the way teachers are compensated and dramatically increase the salaries of competent teachers. The plan was not enacted, but it helped spark a national debate on teacher compensation. After a series of interim legislative studies and slight modifications, The Better Schools Program became law in an unprecedented special legislative session in early 1984.

Tennessee, like many Southeastern states, has generally been below average in expenditures for public education. Reforms enacted in the mid-1970s simplified school finance but added little new money. In 1983–84, current expenditures per pupil were estimated at $2,059 (48th in the nation) for the state's 818,205 public school students. Revenues totaled $797 million from the state, $766 million from local districts and $174 million from the federal government for a total of $1.74 billion. The average teacher salary was estimated at $17,900, 44th in the country.

The Better Schools Program has six major components:

- ★ A five-step career ladder program for teachers (FY85 cost: $50 million)
- ★ Across-the-board salary increases of 10% (FY85 cost: $69 million)
- ★ Programs to improve students' basic skills and computer skills (FY85 cost: $13 million)
- ★ Expanded kindergarten (FY85 cost: $1.25 million)
- ★ Teacher aides in grades 1, 2 and 3; one aide for each 25 students by 1987 (FY85 cost: $6.5 million; FY87 cost: $21 million)

- ★ Other categorical programs (FY85 cost: nearly $30 million)

The legislature appropriated an additional $173 million for public education for 1985, an increase of 22%. About one-half will be allocated through the school finance formula and one-half in flat grants. Over the next three years, the state plans to spend an extra $1 billion on public education, more than double its aid in 1983–84. The commitment to better pay for teachers is clear from the 1985 figures: $119 million of the extra $173 million for 1985 will be allocated for extra teacher compensation.

The entire program, which also includes extra funds for higher education, is funded by new business taxes and an increase in the sales tax from 4.5% to 5.5%.

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Texas

One of the campaign promises Mark White made before he was elected governor in 1982 was to increase teacher pay substantially. When the legislature did not pass a bill on teacher pay the governor introduced in 1983, he established a prestigious Committee on Public Education chaired by a prominent business leader. The committee issued recommendations in April 1984, and a special session of the legislature was called for June of 1984. Significant new measures have been proposed:

- ★ Lengthening the school year, from 175 to 180 days (FY85 cost: $47.5 million)
- ★ Increasing teacher salaries by 10%, creating a career ladder and lengthening teachers' contract year from 183 to 188 days (FY 85 cost: $350 million)
- ★ Reducing class size in grades 1–2 to 20 pupils (FY85 cost: $121 million)
- ★ Establishing a prekindergarten program for disadvantaged 4-year-olds (FY85 cost: $53 million)
- ★ Testing all students each year for promotion from grade to grade (FY85 cost: $7 million)
- ★ Strengthening the state education agency (FY85 cost: $6.7 million)
- ★ Improving and streamlining the school finance equalization formula (FY85 cost: $400 million)

Implementing the recommendations would require adding an additional $987 million to the $4.2 billion 1983–84 state allocation, an increase of nearly 25%. The new school finance formula would also increase local contributions, estimated at $4.0 billion in 1983–84. Current operating expenses estimated at $2,510 per pupil in 1983–84 for the three million students would increase substantially, as would teacher salaries estimated at $20,100 for 1983–84.

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Utah

Enrollments have been increasing at 5% a year in Utah (about 18,000 students), so the state has been struggling to finance expanded educational services. For this reason, and because interest in education excellence is high, the legislature asked the governor to appoint the Utah Education Reform Steering Committee in mid-1983. The Steering Committee, which included representatives of business and industry, issued a major report late in 1983.

Utah's current operating expenditures per pupil in 1983–84 are estimated at $1,892, 49th in the country. Students total 375,000 in average daily membership. Average teacher salaries are $20,256, about 28th in the country. (Salaries will probably stay below average, since many new teachers will be entering the system.) Revenues for 1983–84 are estimated at $897 million, with the state providing $491 million, local districts $360 million and the federal government $46 million.

The Steering Committee requested funds to maintain current programs and to improve education. Below are major proposals, the funding requested and the final legislative appropriations for the 1985 school year.

Education Program	**Funding Requested**	**Funding Appropriated**
Career Ladder for Teachers	$41.4 million	$18.0 million
School Productivity	8.0 million	1.0 million
School Finance Formula	55.7 million	35.8 million

The committee also requested new funds to launch a major technology initiative. The legislature did not fund that program, but it did enact a 25% tax credit for corporations that donate computers to schools.

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3. The Political Economy of Education Reform

To discover how the eight states determined the costs of the education reforms, how money for reforms will be allocated to school districts and teachers, who undertook fiscal analyses and what new finance issues need research attention, ECS conducted telephone interviews in the spring of 1984. Approximately 30 people in governor's offices, legislative research offices and state education agencies were asked the 12 questions listed in the Appendix.

Each person interviewed was asked to list the major elements of education reform in his or her state. Cited frequently were nine elements:

- New programs for teacher compensation
- Longer school days and school years for teachers and students
- Smaller classes and additions of support staff (guidance counselors, reading aides, reading specialists)
- Stiffer requirements for high school graduation
- More student testing
- Prekindergarten programs for disadvantaged children
- School improvement initiatives
- Merit school plans
- School finance reforms

Underlying these elements of reform were four major concerns. The first was to recruit and retain better teachers and administrators. The second was to strengthen the curriculum and improve schooling processes. This concern, rightly or wrongly, was derived in part from comparisons of student performance in this country with performance in other countries with whom the United States competes economically, and in part from declining test scores in this country. The third concern was to create incentives to reward superior performance of teachers, schools and students.

The fourth and somewhat surprising concern was for fiscal equity, expressed through continuing efforts to strengthen fiscal equalization formulas. Concern for fiscal equity was clearly secondary, however, and traditional school finance issues emerged only in allocation decisions made after the substantive elements of education reform had been determined.

There were surprising similarities in the methodologies states used to determine costs. One reason may be that the people who determined costs were those traditionally involved in finance issues, i.e., the school finance experts in each state. In Arkansas, school finance staff in the state education agency were centrally involved in designing a new school finance formula as part of the reform package. In California, high-level school finance staffers in the state education department had become legislative staff. (One had become chief aide to the speaker of the assembly, another chief of staff for the prime senate author of the reform bill.) In Florida, a national expert on school finance had become education aide to the governor. Two other national experts in school finance were staffers for key House and Senate leaders. South Carolina's top school finance expert had become the governor's education aide; school finance staff in the state department of education conducted most of the cost analyses. This pattern of involving key school finance experts held for Tennessee, Texas and Utah as well.

Also similar was a tendency to alter initial estimates of cost to fit available revenues during the course of legislative debate, a not unusual political phenomenon. The costs themselves were usually determined by broad policy decisions that limited the arena in which analytic techniques could be used. For example, the costs of career ladders or merit pay programs were determined much more by the number of rungs on the ladder or the level of awards — by decisions on the key policy issues — than by costing techniques used once those decisions had been made.

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Teacher Compensation

Raising the salaries of teachers and administrators and changing the salary structure was an issue all eight states addressed. Four major types of proposals were made: (1) attempts to replace or augment the typical education-and-experience salary schedule with one based on job performance and responsibility (merit pay, master teacher or career ladder plans); (2) across-the-board salary increases; (3) increases linked to lengthening the school day for teachers or the contract year; and (4) raising salaries of beginning teachers.

Merit Pay, Master Teacher Plans or Career Ladders

All of the eight states except Arkansas established mechanisms of this sort. California created the Mentor Teacher program that provides an annual bonus of $4,000 for 5% of the teachers in each district. Florida's long-range plan is to have a two-rung master teacher program. A teacher on the first rung is designated an "associate master teacher" and receives a $3,000, three-year, renewable bonus; a teacher on the second rung is a "master teacher" and receives a $5,000 bonus. (Only the first rung now exists.) The Illinois program, described in the previous section, provides an annual bonus of $1,000 to 500 teachers. In South Carolina, 10 districts will test variations of career ladder, master teacher or bonus programs next year, from which the state will then select models for implementation. In costing-out the program, the state education department assumed 20% of teachers would receive a $3,000 bonus, which is a preliminary indication that the final plan will be a bonus plan. Tennessee enacted the most comprehensive career ladder plan. The ladder has five rungs: (1) probationary teacher, with a one-year term preceding either promotion to the second rung or dismissal; (2) apprentice teacher, with a one-year term and $500 salary supplement, followed by promotion or dismissal; (3) career level I, with a five-year renewable term and $1,000 salary supplement; (4) career level II, with a five-year renewable term and a $2,000 or $4,000 salary supplement for a 10- or 11-month contract; and (5) career level III, with a five-year renewable term and a $3,000, $5,000 or $7,000 salary supplement for a 10-, 11- or 12-month contract. (Tennessee and South Carolina have similar plans for administrators.) Texas had set aside approximately $225 million for a career ladder, but the ladder had not yet been designed; the governor had, however, proposed giving the most experienced teachers $6,000 bonuses each year. Utah is awarding districts flat grants totalling $15 million plus benefits to design local career ladder programs. A maximum of 50% of the funds can be used for extended contracts, with the remainder allocated on the basis of teacher performance. In all eight states, the participation of teachers is voluntary.

Varying considerably by state are percentages of eligible teachers and assumptions about how many teachers will receive awards. California and Illinois set quotas — 5% in California and 500 teachers (.5%) in Illinois. In most of the other states, general assumptions have been made about eligibility and numbers of awards. In Florida, for example, an associate master teacher must have an in-field master's degree; about 10,000–13,000 of the state's 33,000 teachers have this degree, and the state expects to make awards to 50% of them. South Carolina has assumed that 20% of teachers will receive awards. In Tennessee, where teachers need a minimum of three years of experience to be eligible for career level I, the state estimates that 80% of the 40,000 teachers meeting that criterion will be promoted. Estimates of how many teachers will move to career levels II or III are unavailable, but no quotas have been set. Eligibility in Utah will vary with the design of each local plan. In short, the percentage of teachers likely to earn pay increments or bonuses varies from less than 1% in Illinois and 5% in California to 80% in Tennessee.

Clearly, more research is needed to identify percentages of teachers who meet specific criteria and, at least for career ladders, percentages of teachers needed on various rungs for adequate staffing.

Types of awards also vary widely. California and Illinois award one-year, lump-sum bonuses. The Tennessee awards are added to the salary base, are cumulative and (at the top three levels) are awarded for three to five years. Florida's associate master teacher award is for three years and can be renewed; the proposed master teacher award will be larger and good for a longer period. Although types of awards are as yet unspecified in South Carolina, Utah and Texas, most respondents stated that award amounts would be based on assumptions about the number of teachers eligible and available revenues.

Dollar amounts of the awards also varied widely, from $1,000 in Illinois to $7,000 in Tennessee. The $4,000 increment in California approximately equals the difference between the average daily salaries of principals and teachers times the average number of days in a teacher's contract. That is, the daily pay of principals and mentor teachers will be roughly equal.

To the costs determined by multiplying the number of teachers on each rung by the award for that rung must be added the costs of program administration and teacher evaluation. These can be substantial, consuming nearly 20% of the total cost in Tennessee.

In all eight states, the revenues to finance these types of raises for teachers derive completely from state sources and are allocated outside the school finance formula as flat grants to school districts or teachers. In short, the developing current practice is for the state to pick up to the total tab for career ladder or merit pay programs and distribute dollars on an unequalized basis to local districts.

Across-the-Board Increases

Six of the eight states give teachers across-the-board raises. School districts in Arkansas must either spend at least 70% of the state aid increase on teacher salaries or half the amount needed to raise salaries to the average of surrounding states, whichever is less. Florida's policy is to raise average salaries to the top quartile in the country. The goal in South Carolina is to raise teacher salaries to the average of the Southeastern states. Texas and Tennessee reform plans include a 10% across-the-board pay hike.

The extra costs were determined by multiplying an average salary-plus-benefits figure by the number of teachers and the percentage increase. Funds for across-the-board raises will be allocated through the school finance general aid equalization formula rather than through categorical grants. Since school districts in Arkansas, Florida and Texas must increase their financial contributions to education, local money will also be available for general salary increases in those states.

No respondents gave explicit reasons for allocating across-the-board increases through the school finance formula and career ladder awards outside that formula. The explanation may be, however, that across-the-board increases are considered enhancements of plans already in place for which the school finance formula has been the distribution mechanism, whereas career ladder programs are considered categorical programs that need a new distribution mechanism.

Increases Linked to Longer Contracts

All eight states except Illinois partially link more pay to more work. Sorting out percentages of pay increases due to outstanding performance, across-the-board hikes and longer contracts is difficult, but longer contracts clearly play at least a limited role.

Arkansas has extended teachers' contracts by 10 days. California provides fiscal incentives to school districts that voluntarily lengthen the school day or school year, certify they already meet new state criteria or reinstate summer school; for each measure the district undertakes, it receives extra money it can use to increase pay. Florida provides fiscal incentives to districts that have seven periods in the high school day or will add a seventh period; the funds can be used to increase teacher load and pay or to hire more teachers. In committee deliberations in South Carolina, there seemed to be strong consensus for "merit work," i.e., extended contracts for the best teachers. Part of the pay hike in Texas includes funds to extend teachers' contracts by five days. Utah stipulates that school districts can use up to 50% of career-ladder funds for extending teacher contracts. Large pay increases at the top levels of Tennessee's career ladder come with contracts of 10, 11 or 12 months.

The extra costs were determined by multiplying the number of extra days (or months) by an average salary-plus-benefits figure. All eight states supply all the extra money to extend contracts, but distribute funds to school districts in different ways. Arkansas and Texas will distribute funds through new school finance formulas; California, Florida, South Carolina and Utah will distribute funds as categorical grants. The reason for the difference may be that extended contracts are statewide mandates in Arkansas and Texas while in California, Florida and Utah they are simply incentives for districts that volunteer to participate.

Underlying all plans is the notion of making teaching a full-time occupation for professionals. Although some programs take only modest steps toward this goal, there seems to be widespread understanding that recruiting and retaining high-quality people whose alternatives are full-time jobs requires that public schools also offer opportunities for full-time work.

Raising Salaries of Beginning Teachers

California is the only state studied that will raise the salaries of beginning teachers. The state will provide aid to increase beginning salaries by 10% per year for the next three years in districts where beginning salaries now are less than $18,000 (a figure that will be adjusted for inflation each year). To determine costs, the state identified the number of beginning teachers in each district with salaries below $18,000 and calculated how much money was needed to raise these salaries by 10% or bring them to $18,000. The cost for 1983–84 was relatively low, about $12 million, mainly because few districts in California are hiring new teachers. Because the student population of California is growing, extending the program beyond three years will be very expensive.

Summary

Concern about teacher pay is obviously widespread, and states are willing to take expensive steps to remedy the situation. Even so, most pay-for-performance plans require modest funding increases, in the range of 5–10% of current salaries (Thompson, 1984).

Policy makers lack some important information about how compensation plans can help recruit and retain better teachers, as well as improve schools. Much new research is needed, and quickly (Pelavin and Flannelly, 1984).

What could help states and school districts in the short run are clear standards for changing teacher pay. One standard might be raising beginning pay to the level of beginning salaries for liberal arts college graduates in a given region or labor market. Another might be setting average teacher pay after 12 years, say, at the average salary of all college graduates in an area. Top teacher pay, after 20-24 years, could be set at the average salary of middle-level managers in the private sector.

Also needed is analysis of the relationship between economic incentives for teachers and other incentives (Rosenholtz, forthcoming). Susan Rosenholtz suggests that the major issues in recruiting and retaining good teachers are not extrinsic and economic but intrinsic and related to teachers' feelings of efficacy. Mitchell, Ortiz and Mitchell (1984) suggest that teacher rewards need to be conceived in even a broader context including teacher motivations, intrinsic and extrinsic rewards, and incentives for individual teachers, groups of teachers and schools. The need for more research on teacher compensation extends beyond economics to the mix of motivations, rewards and incentives. Also essential are systems for evaluating teachers that are linked directly to school goals and the teacher outcomes desired (Darling-Hammond, Wise and Pease, 1983).

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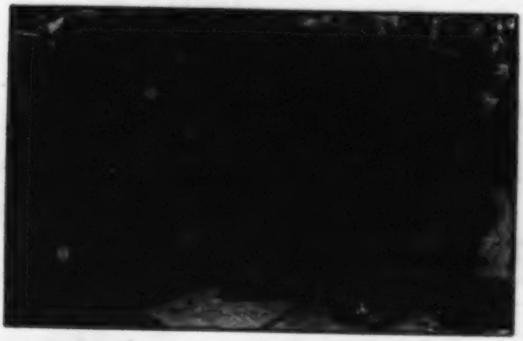

Longer School Days and School Years

Arkansas, California, Florida and Texas have proposed lengthening the school day and school year, though none of the proposals match the 20% increase advocated in some national reports. Arkansas increased the minimum day from 5 hours to 5.5 hours and lengthened the year from 175 days to 180 days for students and from 180 days to 190 days for teachers. California provides fiscal incentives to lengthen the school year from 175 days to 180 days and to reinstate six periods (lasting a minimum number of minutes) in high schools. Texas proposes to extend the school year by 5 days for both teachers and students; the first public draft of the Texas plan extended the school day (by 2 hours, at a cost of $303 million), but that measure was eliminated from the final proposal. Seemingly most radical of these modest proposals is the Florida proposal to add a period in high schools, but it turns out that many districts already have this extra period.

Various techniques were used to determine the costs of these extensions. Arkansas determined no specific costs: all new standards and programs are to be implemented with the money provided under the new school finance formula, and the state will assess funding adequacy in 1987. California determined costs by multiplying 5/175 (the ratio of the extension to the length of the old year) by the revenue limit for each school district, then multiplying the result by 60% (the average amount of current operating expenditures represented by instructional expenditures). This produced estimates of extra costs for teachers and administrators, but not for operations, maintenance and support staff. Even so, the initial estimates were in the $100 million range, and the final bill made the program voluntary. The same general methodology was used to estimate the cost of lengthening the high school day from an average of 5.5 periods to an average of 6.0 periods. Estimated costs of more than $200 million made the program too expensive to mandate, so it, too, became voluntary. The state makes about $35 per student available to districts choosing to undertake both extensions, much less than the calculated costs.

In Florida, one of several methods used to determine the cost of adding a seventh period to the school day (increasing the minimum number of hours to 1,050) simply took one-sixth of the current cost of high school education; the result was an estimated cost of more than $100 million. Another method used a different base, not the minimum 900 hours of high school study required but the 950 hours that proved to be average practice. The result was a lower but still substantial figure: $66 million. In the end, $27 million was made available for 1984 for adding a seventh period; schools volunteer to add the period and use it for mathematics and science courses that help students meet new requirements for high school graduation.

Texas separated salary costs for teachers and administrators from all other costs, which were determined by multiplying [illegible] (the ratio of the extension to the old base) by the cost of transportation, food, operation, maintenance, support staff, etc. Costs for teachers and administrators were included in the overall pay increase package.

All four states will fund the total cost of the longer days and years but will distribute funds to local districts in different ways. Arkansas and Texas, which make extensions mandatory, will distribute the funds through new school finance formulas; California and Florida will award flat grants to school districts voluntarily participating in the program. In California, districts that already have extensions in place will receive extra funds as well.

In summary, the dominant method for determining the costs of extending school days or years is to multiply the ratio of the extension and the old base by instructional costs, all noninstructional costs or both. States that identify costs discover early on that the price is high and make extensions voluntary. Arkansas skirted this issue somewhat by assuming the new dollars were sufficient rather than predetermining costs. Allocating the funds through the school finance formula if the program is mandated seems to be standard practice; where programs are voluntary, allocations are through flat grants.

Extensions of school days and years have been modest, in part because longer extensions are expensive. However, these small extensions can result in significant increases in student-engaged learning time if used for inservice training (Rosenshine, 1983). Larger extensions could be a waste of money, since mechanistic increases in school days and years are not significantly related to student achievement (Levin, 1983).

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Smaller Classes or Additional Staff

Since even small reductions in class size are very expensive, only some states reduced class sizes and then only in limited types of classes. Arkansas adopted new standards that reduce class size to a maximum of 23 in grades 1 and 2. California mandated strengthened guidance counseling in the 10th grade. Florida expanded a writing program: in participating schools, high school English teachers have no more than 100 students, and they are to assign and correct one writing assignment per week. Florida also added secondary reading specialists. Texas proposes to reduce class size to 20 pupils in grades 1 and 2.

Calculating the costs for these programs was relatively straightforward, and each state used approximately the same methodology. The number of additional teachers or staff needed was determined, usually by school district and usually with data available in the state department of education. This number was then multiplied by an average salary-and-benefits figure. States solved technical difficulties (whether to use last year's average salary or a predicted next year's average, whether to include all benefits and Social Security costs, etc.) in various ways.

Programs in California and Florida were categorical. Funds, all from the state, were allocated to school districts as flat grants. In Arkansas and Texas, the programs were part of larger, state-mandated reforms and funds were allocated through new school finance formulas.

Reducing class size was a modest component of reform packages because the cost of even small reductions is high. Further, most staff interviewed knew that major class size reductions (to 16 students) are needed to have a significant impact on student achievement (Glass and Smith, 1979).

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Stiffer Requirements for High School Graduation

Arkansas, California, Florida, South Carolina and Texas increased the number of courses students must complete to graduate from high school, but only partially costed-out and funded these new requirements.

Arkansas did not estimate costs, assuming that increases in state aid would cover them. California merely reinstated minimum high school graduation requirements that total only 11 credits, far below the practice in most districts, and provided no extra funds. Florida students must now receive a total of 24 credits to graduate from high school, the highest requirement in the country. The one attempt to identify the cost of meeting the new requirements compared current course offerings to the new requirements. An assumption was made that some old courses would be dropped as new courses were added but that there would be a net gain in courses. Although the estimated costs were substantial, in the end, no separate appropriation was made to meet them; the only extra money is the $27 million districts may use to add a seventh period.

South Carolina approached the issue of cost most directly. The state education department estimated the number of new teachers needed to offer the new courses required in mathematics and science, then multiplied this number by the average teacher salary and added benefits. Staff assumed net additional courses with no deletions of current courses. The minimum extra cost was $5 million.

New requirements for high school graduation in Texas will be part of a total restructuring of the high school curriculum. Funds for this restructuring will be allocated through a new school finance formula; no individual new requirement will receive a separate cost estimate.

The states studied and the rest of the 30 states that have raised high school graduation requirements since 1980 are providing very little extra money to fund these new requirements. There is an assumption that school districts will somehow comply, perhaps by dropping courses now seen as superficial. Over time, however, the real costs will emerge. New curricula, new instructional materials and trained teachers may be needed, as well as ways to combine these elements.

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More Student Testing

States are interested in testing more students, more often, in more subjects and for more purposes. Five of the eight states studied expanded state testing programs; Florida already has an extensive program. Arkansas now requires 8th-grade students to go through a "promotional gate" by passing a test before they enter high school. South Carolina will require high school seniors to pass an exit examination before they graduate. California set up honors examinations for high school students. Texas is proposing that students at all grade levels pass tests before they are promoted to the next grades.

Estimated costs of testing programs were low, perhaps because they covered only developing, printing, correcting and, in some cases, administering the tests and may have seriously underestimated secondary effects and downstream costs. Only South Carolina acknowledged that a secondary effect of its exit exam will be remedial services for students who do not pass. Its education reform program includes a comprehensive remedial program for all students at each grade who do not meet minimum performance standards. The cost of this remedial program — $59 million — equals 30% of the cost of South Carolina's entire education reform program.

Dissatisfaction with "social promotion" (the practice of promoting students on the basis of attendance more than of performance) undergirds much of the heightened interest in testing. But research provides no clear support for the shortcomings of social promotions nor for the advantages of promotional gates (La Barre, 1984). Students who are held back need special help, and the number of years a student can be held back is limited. Underperforming students who are promoted also need special help. In the long run, the real issue seems to be whether students who perform below standards receive special help, not whether they are promoted or held back. Requiring students to pass exit examinations or other types of minimum competency tests is one way to raise standards and improve performance, but other ways are likely to be as successful (Anderson, Citron and Pipho, 1983).

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Prekindergarten Programs for Disadvantaged Children

South Carolina and Texas both propose to sponsor preschool programs for 4-year-olds who are educationally disadvantaged. The rationale comes from research that shows early intervention can be a cost-effective way to reduce the need for remedial services in later grades (Weikart, 1982). In both states, the number of children eligible was estimated from available data; the cost was simply the number of teachers needed times average salary and benefits. In Texas, one teacher and two aides were proposed for each group of 35 4-year-olds.

Other states have discussed the efficacy of providing public schools for 4-year-old children. In 1983, the New York commissioner of education proposed dropping the school-starting age to four and eliminating the last year of high school. Unless such grade-for-grade trade is made, however, the cost of serving 4-year-olds in the public schools is high.

Wholesale public education for 4-year-olds could have two questionable effects. Initially, large investments of state money would simply replace private money for the many families that already pay for preschool services on their own. There is also the danger that, as with K–12 programs, public preschool programs would become remarkably similar across the country, thus reducing choices that now range from structured Montessori programs to in-house day care. The cost-effective approach may be that taken by South Carolina and Texas — providing preschool only to at-risk or educationally disadvantaged students.

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School Improvement Programs

Most education reform programs focus on the hardware of reform — more courses, tougher courses, increased requirements, higher standards, longer days, extended years. But many researchers suggest that developing an infrastructure for educational change will increase the likelihood of successfully meeting new standards (Boyer, 1983; Goodlad, 1983; Odden, 1984; and Sizer, 1984). This would require strengthening the instructional effectiveness of teachers, developing in principals the skills to be instructional leaders, implementing the characteristics of effective schools and developing each school's capacity for ongoing improvement. Research has identified numerous school improvement initiatives, many of them low-cost (Cohen, 1983; Odden, 1984; and Crandall et al., 1983), and states and school districts have already implemented many programs based on this research (Odden and Dougherty, 1982). Recent research suggests that many state education departments are augmenting their ability to help districts improve program quality (Barnes, Furhman, Odden and Palaich, 1983).

In Arkansas, which has a very interesting and extensive inservice training program for instructional effectiveness (Odden, 1983), the state education department (now with about 150 staff) received 46 new positions to help districts implement the new education standards, to expand training in instructional leadership for principals and school board members, to train teachers in classroom management, to develop an effective schools program, to train principals and teachers in schools where students are poor readers and to train parents how to teach at home. The cost of these programs — a few million dollars — is insignificant compared to the $200 million cost of the entire education reform program. But the payoff should be high.

California has established teacher centers and regional computer centers for inservice training and has expanded the school improvement program. South Carolina based a new teacher training program on the Arkansas model, expanded its administrator academy and funded a principal assessment center, all for less than $2 million. Utah put $1 million into a school productivity program that provides seed money to local districts to restructure staffing and program delivery. Several local initiatives have yielded substantial dividends — cost savings far greater than amounts expended.

These school improvement programs were funded by small sums of money people "felt" would be sufficient. The new programs have also received modest funding, but staffing them adequately will probably require supplemental funding over time.

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Merit Schools

Emerging in these eight states and elsewhere around the country are "merit school" programs. A state program in South Carolina, based on the program now in place in Columbia, South Carolina, provides a $10 bonus per student for specified school-level improvements, up to a maximum of four. Student achievement must be one of the four improvements. Others include student and teacher attendance, drop-out rates and community satisfaction. The state appropriated $28 million for the fourth year of the program. Merit school programs have been proposed in both Florida and California for the 1985 school year.

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School Finance Reform

Although some experts were concerned that fiscal equalization might by overlooked in the enthusiasm for education excellence, the fact is that the eight states studied have improved and increased funding of school finance formulas.

Three states combined school finance reform with education reform. When the state supreme court required Arkansas to revise its school finance formula (essentially a total-dollar/save-harmless plan), the legislature devised a pupil-weighted foundation program that incorporates funding for the handicapped, vocational education, textbooks and some other small programs. All new dollars will be allocated through this new program, which also requires property tax increases in nearly one-third of all school districts. Next year, Illinois plans to consider a package that will include several education reforms, an overhauled school finance formula based on a two-year state board study, property tax reduction and probably reinstatement of the temporary state tax hikes that expired in mid-1984. Texas will design an entirely new, program-driven foundation program through which it plans to allocate all new money for education reform.

The five other states modified their formulas. California streamlined its revenue-limit formula. The hold-harmless provision was changed from a total to a per-pupil basis. The revenue limits were moved from a percentage to a fixed-dollar amount, which provides low-spending districts more money on a percentage basis; limits were differentiated for elementary, high school and unified districts. The revenue limits for low-spending districts were brought to within $50 of the previous year's average for 1984 and to the previous year's average for 1985. The state allocated most of the $800 million for its reform through this revised formula. The revenue limits were increased an average of 8%. Funding for categorical programs rose by 6% with special education receiving an 8% hike.

Since 1973, Florida has had a sophisticated pupil-weighted foundation formula that allows very limited local leeway above it. When the state increased aid by $166 million, 75% ($123 million) was added to the formula, thus increasing funding for general aid as well as for categorical programs. The local property tax required under the formula also was raised to improve overall fiscal equity.

South Carolina, which enacted a school finance reform in 1979, is adding a K–12 compensatory education program, making adjustments to the special education program and allocating about 75% of the new funds through its pupil-weighted foundation formula. Tennessee allocated 50% of new funds through its formula (which was streamlined in 1977), and Utah adjusted its formula (revised in 1973) and allocated 61% of new funds through it.

Since half or more of all money for education reform is being allocated through school finance formulas, finance equity clearly is not being shoved aside in the rush toward excellence. Although school finance reform and fiscal equalization have received less publicity than education reforms, the fact is that they continue to receive significant attention and substantial new funding. Categorical funding also has held its own, increasing as general aid increases in states that use pupil-weighted formulas. There is little evidence of reallocations from fiscal equalization to education excellence. Most new funds flow through school finance formulas; the only significant exception is funding for new career ladder programs, which, in all cases but one, represent less than 25% of the increase in state aid.

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Final Comments on Cost and Allocation

Attention to the long-run costs of reform is mixed. South Carolina estimated five-year costs, Tennessee and Texas three-year costs, California and Florida two-year costs for some programs. Arkansas and Utah did not identify long-term costs. Although two years or less is often "long-term" in politics, states would be wise to look farther ahead. Raising salaries for beginning teachers and increasing high school graduation requirements have substantial costs beyond two years.

States seem to be more active than local governments or the federal government in education reform and funding it. This means that involvement in state politics is the prerequisite for affecting education reform.

The sales tax seems to be the preferred source of new revenues for education excellence. Arkansas and South Carolina raised the sales tax a full penny, Texas hopes to raise it a penny, Utah made permanent a one-half-cent sales tax. Florida, which in 1983 enacted a new tax on the foreign income of state-based corporations (which likely will be reduced in the future), raised the sales tax by a penny in 1982. But California funded its plan mainly through revenue growth and closing tax loopholes, and Illinois seems likely to raise the income tax and reduce property taxes in 1985.

Even though many states have taken the tough political step of raising taxes to finance education reform, the new funds still fall far short of reasonable estimates of costs. The American Association of School Administrators (1983) studied the costs of implementing the recommendations made in *A Nation at Risk* and estimated that an average increase of 28% was needed. The estimate of a prominent national expert in education was 20–25% (Howe, 1983). A study of the 1983 recommendations of the Regents in New York State also produced an estimate of 20–25% (Wagner, 1984), and the total estimated real costs of the reforms in some of the states studied approximated 25%. But actual allocations represent increases of only 6% to 17%. These large and politically difficult allocations are not large enough; education excellence reforms are being underfunded. Unless funding increases further, the country will not reach the lofty goals of the national reports — or the goals will have to be scaled down.

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4. The New School Finance

Education reform has placed new issues on the school finance agenda. Disparities in expenditures per pupil and their relationship to local property wealth per pupil remain important and are continuing to receive significant attention. But expanding the traditional agenda is the need to determine the costs of new education programs. Salary structures need revision. Rationales are needed for determining which level of government should pay for new programs and for deciding how to distribute state funds to school districts and teachers. Less specific but perhaps even more important, scholars and policy makers need to merge the traditional and the new agendas into integrated education policies undergirded by appropriate finance and governance structures. For finance, this requires identifying: (1) the finance aspects of the new equity issues raised by education reform; (2) the new issues in traditional school finance; and (3) the new issues raised by social and economic changes broader than the specifics of education reform.

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A New Equity Agenda and Its Finance Implications

The goal of education reform today is to bring excellence to the nation's public schools, not necessarily to emphasize equity, access and fairness. Whatever the tension between the old equity agenda and the new excellence agenda, education reform programs raise at least four new equity issues, all of which have finance implications: the differential impact of higher standards and tougher requirements, differential access to new curricula and better teaching, differential access to master teachers and master teacher programs, and differential access to computers.

Higher Standards and Tougher Requirements

Raising standards and tightening requirements are likely to be only the first steps in a process. Some students will fail to meet the new standards, and some will have difficulty fulfilling the new requirements. What does a school system do then? At some point, it must provide additional instructional services, and this will be expensive. At a cost of nearly 33% of all new money for education, South Carolina has developed a K–12 state compensatory education program for students who do not pass new state-required tests. California and Florida already have remedial programs in place but may need to expand them. Arkansas and Tennessee have given school districts responsibility for students who fail to meet the new requirements, but experience elsewhere suggests that a future state role is likely.

The imposition of higher standards raises other questions of equity. Will students who fail to meet new standards be predominantly low-income and minority students? Will rates of failure be higher in school districts with below-average fiscal resources? Will dropout rates rise as the spending of districts or schools decreases? If so, corrective state policies will be needed.

New Curricula and Teaching Policies

As states set new curricula and teaching policies, analysis of the use of resources within school districts and schools becomes necessary. School finance studies need to go beyond district-level dollar allocations and investigate student access to curricula content, engaged learning time and effective teaching.

Student achievement relates to the content of the material taught (Kirst, 1983). Even when a specific curriculum is required, topics covered in classrooms can vary enormously (Denham and Lieberman, 1980). Moreover, the time students are actively engaged in learning a given curriculum varies across classrooms within schools and across schools within school districts (Denham and Lieberman, 1980). Effective teaching and the teaching of higher-order skills also varies dramatically (Goodlad, 1983). These issues of access and equity within schools are at least as important as the traditional issues of fiscal distribution, suggests Kirst, and he finds some evidence that access to curriculum content, learning time and effective teaching differs with student ethnic and income characteristics as well as with school and district fiscal characteristics. Analyzing these issues should have high priority, especially since curriculum and teaching are central to education reform.

Distribution of Master Teachers

Although new state programs to improve the economic rewards for teaching are broad-based and comprehensive, most states have not addressed how these new programs merge with the serious inequities in teacher compensation embedded in current systems. High-spending districts already pay teachers significantly more than low-spending districts, and they usually also have more teachers per student. On the basis of less quantitative evidence, high-spending districts also seem to have teachers with better training and better skills.

If master teacher and career ladder programs are to benefit students in all school districts, these inequities will need to be addressed. In states without quotas on the master teachers in each district (e.g., Tennessee), the distribution of master teachers across types of schools and school districts should be analyzed. This will allow identification of inequities in student access to the best teachers. In states with quotas, district definitions of master teachers should be analyzed to determine whether and how alternative definitions affect students. The effect of current salary and benefit inequities on state compensation programs should also be analyzed.

Access to Computers

Some evidence already suggests that more computers are available in wealthy, high-spending districts than in poor, low-spending districts (Quality Education Data, Inc., 1984), that more computers are available for students from high-income families and that computers are used for different purposes with different types of students (Center for Social Organization of Schools, 1983, 1984). They are used to teach low-income and minority students basic skills; higher-income students learn higher-order skills. This evidence suggests at least two links between school finance policy and computer policy that states may need to investigate. The first concerns equity of access to computer hardware and software and the degree to which access relates to the traditional issues of differential resources per pupil across school districts (Pogrow, 1983a). The second concerns the use of computers and telecommunications technologies within districts and schools and the degree to which use relates to economic and finance variables.

Since the funding of education reform is less than estimated costs, more efficient ways to deliver education services are needed. Computers offer a significant alternative (Pogrow, 1983b) and additional ways to use computers to reduce education costs need to be explored.

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Education Reform and New School Finance Issues

Related to traditional equity issues in school finance are four new issues raised by education reform: the movement to finance programs and services rather than to use dollar-level formulas; the financing of some education excellence initiatives outside school finance formulas; a comparison of funding for school finance and categorical programs with funding for education excellence programs; and shifts in the local and state tax burdens as states raise taxes to finance education excellence.

New Types of School Finance Formulas

States policy makers began in the late 1970s to ask how school finance formulas could relate more to the education programs and services they financed. Movement in this direction is more apparent in the 1980s. Although most of the money for education reform is being allocated through traditional formulas, the purposes of state aid are now specified: to fund across-the-board increases in teacher salaries, to finance extensions of the school day or year, to fund testing programs, to reward outstanding performance. Some states developing new formulas identify the programs and services the state wants to include in the foundation program and then calculate costs for each district. Illinois has been developing this "resource cost model" for the past two years (Chambers and Parrish, 1982), and Alaska is in the process of adopting it. Texas, as mentioned previously, is developing a similar approach. Other states are likely to move in this direction.

Distribution of Education Reform Dollars

Even though most new appropriations for education reform are allocated through fiscal equalization formulas, there is a tendency to view some reform initiatives (e.g., career ladders) as new and separate programs that should be funded by categorical, flat grants. Whether initiatives funded outside the formula enhance or weaken equity remains an issue that every state should address. No state reached the fiscal equity objectives of any school finance reform of the 1970s (Brown and Elmore, 1983; and *Journal of Education Finance*, vol. 8, no. 4, vol. 9, no. 1, 1983). Progress toward equity, or the lack of progress, remains an issue.

Funding Equity and Excellence

Adequacy of funding and the distribution of state aid to core educational programs, traditional equity programs or new excellence programs are all important issues. In the eight states studied, there does not seem to be a trend toward allocating most new funds to excellence initiatives without increasing aid to other programs. In fact, the reverse is true: excellence initiatives in most states are small, categorical programs, receive relatively small allocations, and most state aid increases are allocated to the school finance formula and traditional categorical programs (e.g., state compensatory, bilingual and special education programs). Nevertheless, since the funding of traditional equity programs has received relatively little publicity, it would seem prudent for states to maintain a record of how funds are allocated among programs, if only to demonstrate that progress is being made toward equity as well as excellence.

State/Local Tax Burdens

In the 1970s, when school finance reform and property tax reduction were strongly linked (Callahan and Wilken, 1976), a shift from local property taxes to higher state income and sales taxes produced a tax system that was more progressive. That is, taxes as a percentage of income declined for lower-income families and rose for upper-income families. The reverse seems to be true today. Property taxes — the most regressive tax — have risen, in part to offset declines in federal aid and in part to augment local budgets when state revenues were squeezed by the national recession. Some states — Florida and Arkansas, for example — also are requiring local property tax increases as part of education reform packages. Further, many states are financing reforms by raising the state sales tax, a tax that is at best proportional (equally burdensome on all taxpayers), but usually regressive (most burdensome on the poor).

This retreat on tax reform should be documented and analyzed; pushing for excellence in one area and increasing inequity in another makes little sense. Over time, the public senses the equity or inequity of state and local taxes; public dissatisfaction with the property tax helped motivate the tax and school finance reforms of the 1970s. It would be unfortunate if progress toward education excellence were halted by public dissatisfaction with the means of funding it.

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New School Finance Issues

There are limits on how states can alter the state and local tax system (Gold, March 1984). Partly as a result of these limits, schools have begun to find new sources of funds. The costs of pension programs, generally ignored in the 1970s, are rising. There is debate on whether property taxes will increase or decrease. These are among the intriguing new problems of school finance discussed below.

New Sources of Funds

The intergovernmental fiscal system in this country is quite resilient. In the 1970s, when property taxes became an unpopular source of school funding, states responded by more than doubling their fiscal role. In the early 1980s, when states felt strong fiscal constraints and the federal government reduced support for education, local property taxes rose. It seems that when one avenue of funds is blocked, other avenues open up. Since the use of local and state taxes for education has been restricted in nearly all states, it is not surprising to find that private sources of education funding are being sought and found.

Education Foundations. One new source is the local education foundation, a private entity that provides extra revenue for school districts. This sort of foundation provides supplemental funding for school districts, expands communication between schools and the public and brings more people into the governance of schools. Whether the directors of foundations (who are not elected) will usurp the policy-setting function of elected boards is one concern. Whether foundations will erode general support for education and whether they will grow large enough to affect school finance equity are other concerns.

States, too, are setting up education foundations. West Virginia established a state foundation with a $95,000 grant; it is giving mini-grants to teachers to develop innovative programs. Arizona's foundation, conceived to be a multimillion dollar operation, initially has funds to give travel money and a bonus to the state's teacher of the year. Kentucky also has developed a state foundation.

Education foundations have so far remained small. Most spend less than $110,000 a year, which is only a small fraction of a district's operating budget (Bergholz, 1984). Foundations nonetheless proved very popular in California after Proposition 13 passed, and they are popular in other states where districts experience fiscal pressures. They should be monitored closely to learn whether they move beyond a marginal fiscal role.

Fee-for-Service Activities. One of the most dramatic responses to Proposition 13 in California was the new practice of charging fees for programs that had been free, such as cheerleading, band and after school sports. The California Supreme Court recently ruled that such charges are unconstitutional, because those extracurricular activities are part of a school's core program. But other fee-for-service activities are unlikely to be overturned by the courts. For example, public schools have begun to charge fees for summer computer camps. Some schools now provide daycare for students from seven in the morning until six at night, charging an extra fee for students who participate. Schools with extra space have initiated preschool programs, usually paid for entirely by parents who enroll children. Programs for adults, from computer training to liberal arts classes, are paid for by the participants.

Entrepreneurial activities like these supply schools with additional revenue and offer teachers opportunities for new work and more pay. As these activities expand, their role in the financing and governance of public schools may need to be scrutinized more closely.

Business/School Partnerships. Business/school partnerships supply anything from free tutoring to equipment for computer labs, summer jobs for students and teachers, salary supplements for mathematics and science teachers and outright financial grants. They also expand participation in the governance of the schools, either formally or informally.

The positive short-run political effect of partnerships has been to involve the business community in the schools and help it redefine its stake in the future of public education. State-level partnerships also have been an important factor in the politics of education reform. The Business Roundtable played a key political role in the enactment of California's omnibus education act of 1983, and the support of the business community in South Carolina was vital to reform there. State business groups are studying the public schools in Minnesota, Washington and elsewhere. The ECS Task Force on Education for Economic Growth crossed state boundaries to involve corporate executives in developing, funding and implementing education excellence programs.

One of the many issues that can — and should — be raised about renewed business involvement in public schools is whether it helps all types of schools equally (Caldwell, 1984).

Pension Costs

The problem of funding teacher retirement programs is becoming more urgent. In legislation enacted this year, Maryland cut future pension benefits to finance education reform initiatives; Alabama, Arizona, California, Illinois and New Jersey also face pressing problems related to the costs of pension programs (Ranbom, 1984). In many states, there are proposals to cut retirement benefits, discourage early retirement and require teachers to pay more into retirement systems.

Many factors contribute to the problem:

★ Historical underfunding by state and local governments

★ The aging of the teacher force (as many as half the people currently in teaching may retire in the next 10 years)

★ Inflation in pension costs, especially in states with built-in cost-of-living escalators

★ Increases in the cost of fringe benefits, including retirement (retirement benefits, which require no immediate funding, have often been traded for salary increases for districts with older teaching forces [Wilken, 1984])

Combined, these factors suggest that revenues to fund pension systems must increase or benefits will need to be cut. The substantial attention states are paying to teacher compensation raises other problems for retirement programs. Teachers who retire in the next 5 to 10 years, after receiving across-the-board raises and higher pay from career ladder programs, may earn retirement salaries far beyond current actuarial projections.

In short, the issue of pension costs, a future issue 10 and 20 years ago, will be a present issue from now on. How states will trade off their best interests and the interests of retiring teachers should be clear by the end of the decade (Taylor, forthcoming).

Other Issues

Much discussed recently are "system incentives," i.e., mechanisms that spur innovation, reward superior performance (of students, teachers, schools and districts) and create fiscal flexibility in an increasingly rigid system. States now use formulas to allocate most funds to districts, and most districts use additional formulas to fund schools and classrooms. Yet greater flexibility can produce good results. Grants for schools that show productivity gains have been successful in some districts (Houston, Texas, and Columbia, South Carolina, for example). Grants of this sort are included in the reform program in South Carolina and are being proposed in Florida and California. "Merit pay" for teachers is based on the assumption that the compensation system should offer incentives for outstanding performance. Mini-grants to teachers for program development are creeping into nearly all education reform programs, and administrators are being given seed money to identify cost-saving initiatives (e.g., the productivity program in Utah). More fiscal incentives are likely in the next several years.

Choice in education is taking a variety of forms. The emphasis today is on choice within the public sector. "Fundamental" and "open/living" public schools have proved popular in some large districts. Program evaluations have documented the success of magnet schools in implementing desegregation and increasing public satisfaction with schools. Parents who have selected preschools from a variety of options are demanding similar levels of choice when their children reach school age. Offering students and parents their choice of public school program does, however, add to the cost of education (especially if districts provide transportation), and it increases the complexity of financing and school operations.

Partly because research has shown that the individual school is the unit of school improvement, there is a resurgence of interest in school-based management and school-site budgeting, with talk in some states of school-based formula funding. Since state technical assistance programs increasingly target individual schools (Burnes, Fuhrman, Odden and Palaich, 1983) and since many states have extensive school-based data systems, developing finance formulas school by school is technically possible in the immediate future. Developing school-based finance, budget, management and improvement systems will, however, take time.

Appendix

Survey Instrument on Cost and Allocation Issues Related to Education Reform Programs

1. What are the major elements of the education reform package?

2. What is the extra cost of each element?

3. Is there information on costs over time?

4. How were the costs determined? What techniques were used? Was the need for each district analyzed separately, or were general statewide guesstimates made? What data were on hand that were used? What data would you liked to have had?

5. Who did the costing out? SEA, legislature or gubernatorial staff? Budget, school finance or curriculum and instructional staff?

6. How will the dollars be distributed to local districts? If not through the general fiscal equalization formula, or through a separate fiscal equalization formula, why not?

7. From where do the new dollars come? State or local level — what is the split? Which taxes: sales, income, natural revenue growth, etc.?

8. When did the cost issue arise in the education reform debate? Early on so it was dealt with substantively throughout the debate; in the middle; or at the end so that the tough issues were not given much attention?

9. How did funding fare for the general fiscal equalization formula, and the categorical programs for special populations — state compensatory education, bilingual, and handicapped?

10. Is there a long run strategy for all pieces of the education reform program to fit together? Either a long-term substantive or long-term fiscal strategy?

11. Any general comments or observations on the politics?
    - — What were the major quid pro quos?
    - — Were the high wealth, or high expenditure per pupil districts more involved in the debates, and on what issues?
    - — Who were the key political actors and what were their major concerns?

12. Was education reform funding affected by the general fiscal picture for the state?

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The asterisked (*) items in each category provide brief overviews of the particular issues.

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*Palaich, Robert, James Kloss and Mary Williams. *Tax and Expenditure Limitation Referenda*. Denver, Colo.: Education Commission of the States, May 1980.

Shapiro, Perry et al. "Tax and Expenditure Limitations in Retrospect," *National Tax Journal*, vol. 32, no. 2 supplement, June 1979.

*Williams, Mary. "Earthquakes or Tremors: Tax and Expenditure Limitation Referenda and School Finance," in *The Changing Politics of School Finance*, Nelda Cambron-McCabe and Allan Odden, eds. Cambridge, Mass.: Ballinger Publishing Co., 1982.

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Tuition Tax Credits

American Association of School Administrators. *The Effect of Tuition Tax Credits on Urban Schools*. Arlington, Va.: American Association of School Administrators, August 1982.

*Augenblick, John and C. Kent McGuire. *Tuition Tax Credits: Their Impact on the States*. Denver, Colo.: Education Commission of the States, October 1982.

*Frey, Donald. *Tuition Tax Credits for Private Schools: An Economic Analysis*. Ames, Iowa: Iowa State University Press, 1983.

Gaffney, Edward McGlynn Jr., ed. *Private Schools and the Public Good: Policy Alternatives for the Eighties*. Notre Dame, Ind.: University of Notre Dame Press, 1981.

*Institute for Research on Educational Finance and Governance (IFG). "Choice in Education: Are Tuition Tax Credits the Answer?" *IFG Policy Notes*, vol. 3, no. 1, Winter 1982.

Jacobs, Martha J. "Tuition Tax Credits for Elementary and Secondary Education," *Journal of Education Finance*, vol. 5, no. 3, Winter 1980.

James, Thomas and Henry M. Levin, eds. *Public Dollars for Private Schools*. Philadelphia: Temple University Press, 1983.

Kyle, Regina and Edwin Allen Jr. *Parental Choice of Education: A Literature Review of Significant Research*. Washington, D.C.: E.H. White and Co., 1982.

Raywid, Mary Anne. "Current Status of Schools of Choice in Public Elementary Education." Project on Alternatives in Education, Hofstra University, Hempstead, New York.

Williams, Mary Frase, Kimberly Small Hancher and Amy Hutner. "Parents and School Choice: A Household Survey." School Finance Project Working Paper. Washington, D.C.: National Institute of Education, December 1983.

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RESOLVED: THAT MORE RIGOROUS ACADEMIC STANDARDS SHOULD BE ESTABLISHED FOR ALL PUBLIC ELEMENTARY AND/OR SECONDARY SCHOOLS IN THE UNITED STATES, IN ONE OR MORE OF THE FOLLOWING AREAS: LANGUAGE ARTS, MATHEMATICS, NATURAL SCIENCE

A Bibliography on the 1985-1986 Intercollegiate Debate Topic

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July 29, 1985

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INTRODUCTION

This bibliography is designed to help college debaters with research on the 1985-1986 Intercollegiate Debate Topic: "Resolved: that more rigorous academic standards should be established for all public elementary and/or secondary schools in the United States, in one or more of the following areas: language arts, mathematics, natural science."

The references to materials are divided into six sections: background and overview: educational reform; school effectiveness and quality, testing, and general achievement; achievement and curricula problems: language arts, mathematics, and science; curricula solutions; teachers, school administration and school finance; and congressional publications: hearings, reports, and studies. As these headings indicate, the interpretation of the debate topic has been expanded to include some of the broader policy issues which focus on the quality of education in elementary and secondary schools. The concern with the quality of education and calls for educational reform in recent years have resulted in a number of reports on education with recommendations for change. Establishing "more rigorous academic standards" within specified areas is only one recommendation among many. Consequently, this bibliography provides for the examination of the debate topic within the context of not only the broader issues of quality and educational reform, but it also highlights citations to other relevant issues.

This annotated bibliography is composed of selected periodical articles, books, and U.S. Government publications. The majority of the citations were obtained from the computerized Congressional Research Service Bibliographic Database, created and maintained by the Library Services Division. Other material was selected from collections within the Congressional Research Service and elsewhere in the Library of Congress.

The author wishes to thank her colleagues in the Education and Public Welfare Division and in the Library Services Division for their assistance in the preparation of this bibliography. Thanks are also extended to Richard Gigax, Head, Subject Specialization Section, Library Services Division, who did preliminary and final editing, and to Ann Eschete for technical production work.

Materials in this bibliography may be located at a nearby public, research or depository library. The Congressional Research Service cannot provide debaters with copies of the items listed. Items with an asterisk (*) are reproduced in the reader.

I. BACKGROUND AND OVERVIEW: EDUCATIONAL REFORM

Adler, Mortimer J. The Paideia Proposal: an educational manifesto. New York, Macmillan, 1982. 84 p.

* ----- The reform of public schools. Center magazine, v. 16, Sept.-Oct. 1983: 12-33.

Describes his proposal for reforming the educational system as explained in his book The Paideia Proposal. Includes discussion by other experts in the field.

Albrecht, James E. How do principals view school improvement recommendations? NASSP [National Association of Secondary School Principals] bulletin, v. 68, Dec. 1984: 98-102.

Reports the results of a survey of what principals think about the many recommendations that have been made for improving the schools.

American Council on Education. Business-Higher Education Forum. America's competitive challenge: the need for a national response; a report to the President of the United States. Washington Business-Higher Education Forum, 1983. 51 p.

American Federation of Teachers. Education reform. [Washington] The Federation, 1984. 3 p.

"1983 resolution reaffirmed by [the] 1984 convention."

Contents.--Education today: what we face.--Quality education and quality teaching--a new agenda.--New compensation proposals.--The unfinished agenda.--An action plan.

Barrett, Nanette. Education source book: the State legislators' guide for reform. Washington, American Legislative Exchange Council, 1985. 81 p.

"Contains model legislation for the States which restores freedom of choice to parents concerning their children's education without financial penalties." Areas of model legislation include home education, tuition tax credits, educational vouchers, merit pay, school discipline and crime, private schools, citizenship education, teacher certification, and school finance.

Barriers to Private Sector-Public School Collaboration (1983 : Washington, D.C.) The private sector in the public school: can it improve education? Edited by Marsha Levine. Washington, American Enterprise Institute for Public Policy Research, 1985. 77 p. (AEI symposia, 84B)

A Blueprint for educational excellence: a school board member's guide. Washington, National School Boards Association, 1984. 58 p.

Partial contents.--A process approach for assessing excellence in education.--Seeking excellence through school board policies.--Setting goals.--Curriculum development.--Standards and expectations.--Time, teaching, leadership, and fiscal support: the schools' focal points for productivity.--Implementing the process and measuring outcomes.--Beyond the school district: an arena of broader interaction.

Botstein, Leon. Nine proposals to improve our schools. New York times magazine, June 5, 1983: 58-67.

Lists nine suggestions for improving the quality of education. These include paying teachers more, regular recertification of teachers, and having children start school at a younger age.

* Boyer, Ernest L. High school: a report on secondary education in America. [Sponsored by] the Carnegie Foundation for the Advancement of Teaching. New York, Harper & Row, 1984. 363 p.

Reports on U.S. public high schools as educational institutions. Makes recommendations "to students, teachers, and school administrators, who are immersed in high schools every day; to college professors, who can make a difference in how school issues are resolved; to policy makers on school boards, in state houses, and in Washington, who have inescapable responsibilities for education; and to members of teachers' and other education organizations of influence."

Changing course: a 50-State survey of reform measures. Education week, Feb. 6, 1985: 11-30.

"Offers information on activites in the States, primarily since September 1981, in the key policy areas in which reforms are being discussed."

Cloudy economics, explosive politics: education under siege. National journal, v. 15, July 9, 1983: 1424-1446.

Partial contents.--From crisis to crisis.--After the upheaval, a backlash.--Great hopes may go unfulfilled.

Cooper, Ann. In the real world of education reform, vigilance may be the key to success. National journal, v. 17, Mar. 2, 1985: 460-466.

Considers how "in Texas, legislators and state officials have instituted broad reforms, and teachers and school administrators must now resist the temptation to weaken them."

Doyle, Denis P., and Terry W. Hartle. Excellence in education: the States respond. [Washington] American Enterprise Institute, 1985. 74 p.

Contents.--The context for reform: the capabilities and interests of State governments.--Recent State efforts to reform education.--The next phase: implementing the reforms.

* Educating Americans for the 21st century: a plan of action for improving mathematics, science and technology education for all American elementary and secondary students so that their achievement is the best in the world by 1995. Washington, National Science Board Commission on Precollege Education in Mathematics, Science and ;echnology, 1983. 2 v. (various pagings)

Volume one is subtitled "A Report to the American People and the National Science Board." Partial contents.--Building a new national commitment.--Lessons from other countries.--American successes.--Improving the quality of teaching.-Making the classroom a rewarding place to work. --Raising requirements for mathematics, science and technology education. --Educational uses of the computer.--How the nation should finance needed educational improvements in elementary and secondary school mathematics, science and technology.

The second volume, subtitled "Source and Materials" gives reports on the mathematics, science, and technology curriculum and on educational technology.

* Education Commission of the States. Task Force on Education for Economic Growth. Action for excellence: a comprehensive plan to improve our Nation's schools. Washington, The Commission, 1983. 50 p.

----- Action in the States: progress toward education renewal; a report. Denver, The Commission, 1984. 64 p.

"Reviews recent State initiatives in education reform, i.e., state programs and legislation or state board decisions affecting elementary and secondary education in 50 States, 3 territories and the District of Columbia." Also provides an "overview of trends and activities, followed by some brief descriptions of exemplary State activities and a more detailed profile of activity in a particular State."

Feistritzer, C. Emily. Cheating our children: why we need school reform. Washington, National Center for Education Information, 1985. 84 p.

"The biggest reason schools must change is to meet the demands of the children of the 1980s. These children come from vastly differenct family structures, economic conditions, and language and other cultural backgrounds than did the children of only 15 years ago."

Partial contents.--Student achievement and socio-economic factors.--The changing family structure.--Poverty and children.--Recommendations.--State-by-state data.

Finkelstein, Barbara. Education and the retreat from democracy in the United States, 1979-198? Teachers College record, v. 86, winter 1984: 275-282.

Looks at the current educational reform movement in the U.S. and concludes that "Americans, for the first time in one-hundred-and-fifty-year history, seem ready to do ideological surgery on their public schools--cutting them away from the fate of social justice and political democracy completely and grafting them instead onto elite corporate, industrial, military, and cultural interests."

Gisi, Lynn Grover. How States are reforming public education. USA today (magazine), v. 113, Mar. 1985: 76-78.

Looks at educational reforms by the States which include "new standards for students and schools, the teaching profession, new resources for education, leadership and management, and special student populations."

Goodlad, John I. A place called school: prospects for the future. New York, McGraw-Hill, 1984. 396 p.

(A study of schooling in the United States)

----- A study of schooling: some findings and hypotheses. Phi Delta Kappan, v. 64, Mar. 1983: 465-470.

Reflects on his indepth study ("A Place Called School") of 1,016 classrooms and the implications for school improvement.

Hispanic Policy Development Project. National Commission on Secondary Education for Hispanics. "Make something happen": Hispanics and urban school reform. [Washington] The Commission [1984] 2 v. (163 p.)

"Volume I offers a straight-forward account of what [was] found and what can be done to improve the education of inner-city Hispanics. Volume II contains backup research and essays keyed to the findings of Volume I."

Reports selected findings and recommendations of the National Commission on Secondary Education for Hispanics' study on inner-city public schools. Focuses on "the general status and condition of schools and education in inner cities that have significant Hispanic populations; the factors that most directly affect the success of Hispanic youngsters in urban high schools; [and] the relevance of current reform proposals to the needs of inner-city Hispanic students."

How can the U.S. elementary and secondary education systems best be improved? National debate topic for high schools 1981-1982. Washington, G.P.O., 1981. 724 p. (Document, Senate, 97th Congress, 1st session, no. 97-3)

Compiled by the Congressional Research Service, Library of Congress.

James, Thomas, and David Tyack. Learning from past efforts to reform the high school. Phi Delta Kappan, v. 64, Feb. 1983: 400-406.

Reviews the phases in the proposals for secondary education reform.

Lake, Sara. The educator's digest of reform: a comparison of 16 recent proposals for improving America's schools. Redwood, Calif., San Mateo County Office of Education, 1984. 166 p.

Partial contents.--Key issues.--Specific high school course requirements.--Text summaries.--Recommendations in comparison [by] topics.--Other reports, projects, and studies.

Meeting the need for quality: action in the South. Atlanta, Southern Regional Education Board, 1983. 30 p.

"Documents real progress toward quality. It is an optimistic report, because the course for the future that it charts is offered in the knowledge that there are many public-spirited people in the Southern states who now recognize the critical need for restored momentum in educational progress at all levels--from kindergarten to graduate study."

Meier, Deborah. "Getting tough" in the schools: a critique of the conservative prescription. Dissent, v. 31, winter 1984: 61-70.

Provides a critical analysis of the book 'The Troubled Crusade: American Education, 1945-1980', and the 'conservative' prescription for educational reform. Concludes that "the new litany of 'toughness' will produce neither excellence nor equality--and surely not both and it won't alter the connection between social class and school achievement."

* The Nation responds: recent efforts to improve education. Washington, U.S. Dept. of Education, for sale by the Supt. of Docs., G.P.O., 1984. 229 p.

* National Coalition of Advocates for Students. Barriers to excellence: our children at risk. Boston, The Coalition, 1985. 162 p.

Looks at "each of the groups of students who are most at risk of not receiving a high quality education": low-income, Black, cultural minority, female, and handicapped students; reviews the educational, social, and political barriers to excellence; discusses declining support resources; and makes fourteen recommendations.

National Education Association. Blue ribbon Task Force on Educational Excellence. An open letter to America on schools, students, and tomorrow. [Washington] The Association [1984] 32 p.

"Addresses the wide disparity between what our schools are doing today and what they need to do tomorrow . . . . Describe[s] the conditions in our schools today and identif[ies] practical solutions . . . for educational excellence."

The National reform reports. Education and urban society, v. 17, Feb. 1985: whole issue (115-240 p.)

Partial contents.--The triumph of school reform, by R. Slater and D. Warren.--Did the education commissions say anything? by P. Peterson.--National commissions: blueprints for remodeling or ceremonies for revitalizing public schools, by T. Deal.--High school reform: a critique and a broader construct of social reality, by C. Yeakey and G. Johnston.--The National Commission reports: do the States have the fiscal capacity to respond? By T. Geske and G. Hoke.--Are school districts responding to A Nation at Risk? By R. Wimpelberg and R. Ginsberg.--High school reform and the "bargain" to learn, by M. Sedlak and others.--The reform reports: reaction from the front lines, by A. Shanker.--Reforming teacher compensation, by D. Monk and S. Jacobson.

A New agenda for education. Edited by Eileen M. Gardner. Washington, Heritage Foundation, 1985. 83 p. (Critical issues)

Calls for significant policy changes to reverse the trend in U.S. education toward increased centralization. Presents essays and "action agenda" which detail such steps as: "removing or substantially reducing Washington's role in education; . . . restoring to education its primary function--the academic and moral training of the nation's youth; . . . revising teacher training so that capable people who can master the science and the art of teaching will be attracted into the classroom; . . . and allowing competition in education . . . through a system of tuition tax credits and vouchers."

The Paideia Proposal: a symposium. Harvard educational review, v. 53, Nov. 1983: 377-411.

Contents.--The Proposal in perspective, by D. Ratvich.--The Peter Pan proposal, by R. Gividazda.--The yellow brick road of education, by F. McKenzie.--Qualified praise for liberal learning, by M. Berry.--Education, democracy, and social conflict, by M. Carnoy.--Two cheers for the Proposal, by S. Cahn.--The Paideia response, by M. Adler.

Passow, A. Harry. The future of the high school. Teachers College record, v. 79, Sept. 1977: 15-31.

Maintains that there is general dissatisfaction with the institution of the high school on the part of educators, parents, and students. Numerous recommendations for its reorganization have been made over the years by various commissions, committees, panels, and individuals. From these, the author picks out the common themes to indicate how the current call for reappraisal may affect the future of secondary education.

----- Reforming schools in the 1980s: a critical review of the national reports. New York, ERIC Clearinghouse on Urban Education, 1984. 105 p. (Urban diversity series, no. 87)

Partial contents.--Once again, reforming education.--Secondary education reform in retrospect.--1983--the year of the education reports.--Dealing with the reform reports of the 1980s.

----- A review of the major current reports on secondary education. New York, ERIC Clearinghouse on Urban Education, 1984. 208 p. (Urban diversity series, no. 88)

"Appendix to Reforming Schools in the 1980s: a Critical Review of the National Reports, Urban Diversity Series Number 87."

Partial contents.--The National Commission on Excellence in Education. --The Paideia Group.--A study of high schools.--The need for quality.--An education of value.--Redefining general education in the American high school.

----- Tackling the reform reports of the 1980s. Phi Delta Kappan, v. 65, June 1984: 674-683.

Compares educational reform reports of the eighties, including "A Nation at Risk," to those of the seventies and earlier. Discusses the diverse and changing dimensions of schooling and education. Comments that "the current crop of proposals can once again mobilize the various groups, agencies, and institutions to assess their own programs and operations, using the reports as a guide. There are different demands made on leaders at the local, system, state, and federal levels; in the public and private sectors; and in the educational and noneducational components."

Peterson, Paul E. Did the education commissions say anything? Brookings review, v. 2, winter 1983: 3-11.

Assesses "the major findings and recommendations of the reports--and discusses some of the issues and topics that they avoid. Suggests that the inadequacies of the reports have little to do with the quality of the commissioners who signed them--indeed, one could scarcely find more thoughtful or dedicated public servants--and much to do with the nature of the commissions process itself . . . . Closes by observing that even if the various commission reports had never been issued, American schools would be on the mend."

Quinby, Nelson. Improving the place called school: a conversation with John Goodlad. Educational leadership, v. 42, Mar. 1985: 16-19.

"John Goodlad, director of A Study of Schooling and author of "A Place Called School," has long contended that efforts to change education should be centered not on the teacher or the district, but on the school."

Ravitch, Diane. The troubled crusade: American education, 1945-1980. New York, Basic Books, c1983. 384 p.

Reagan, Ronald. Remarks at the National Forum on Excellence in Education, in Indianapolis, Ind. Weekly compilation of Presidential documents, v. 19, Dec. 12, 1983: 1661-1665.

Believes that "American schools don't need vast new sums of money as much as they need a few fundamental reforms." Advocates six reforms which ". . . can and will turn our schools around."

Reagan in review: a look at Federal education policy, 1980-84. Higher education daily, v. 12, Oct. 15, 1984: 5, 7; Oct. 16: 3-5; Oct. 17: 5-6, 8; Oct. 18: 5-8; Oct. 19: 3, 5.

Presents "a five-part series on the effects of President Reagan's policies on education which . . . assesses the administration's deregulation attempts, budget proposals and its track record on civil rights, as well as Reagan's efforts to promote school reform."

A Response to the national reports. NASSP [National Association of Secondary School Principals] bulletin, v. 68, Mar. 1984: 6-29.

Provides the views of ten leaders of educational associations concerning the various recent studies and reports on American education.

Rich, John Martin. Innovations in education: reformers and their critics. 4th ed. Boston, Allyn and Bacon, 1985. 311 p.

Partial contents.--The Paideia proposal.--Home instruction.--Stimulating learning and curiosity.--Education for pride and achievement.--Nondirective learning.--Beyond freedom and dignity.--The pedagogy of liberation.--Managing retrenchment.--Competency education and minimal competency testing.--Microcomputers in education.--Bilingual education.--Multicultural education.--Mainstreaming.--Educating and gifted.--Cognitive moral development.--Values clarification.--Experiential education and learning.--Tuition tax credits. --Private schools.--Back-to-basics alternative.

Siegel, Peggy M. School reform momentum continues. State legislatures, v. 11, Mar. 1985: 11-15.

Presents "a summary of what states have done since late 1982 to improve public education, and what they are likely to do in 1985." Reform efforts focus primarily on tougher graduation requirements, more student testing, and performance-based incentives for teachers.

Sizer, Theodore R. Horace's compromise: the dilemma of the American high school: the first report from a study of American high schools, co-sponsored by the National Association of Secondary School Principals and the Commission on Educational Issues of the National Association of Independent Schools. Boston, Houghton Mifflin, 1984. 241 p.

Reports on a two-year observation of learning, teaching and student life in American high schools.

----- A review and comment on the national reports; perspectives. Reston, Va., National Association of Secondary School Principals, 1983. 15 p.

"Identifies . . . seven dominant themes or trends in the current studies of education; [and] relates them to his 'A Study of High Schools.'"

Smith, Marshall S. Educational improvements which make a difference: thoughts about the recent national reports on education. Washington, Federation of Behavioral, Psychological, and Cognitive Sciences [1984] 19 p. (Science and public policy seminars)

"Edited transcript presented . . . on February 24, 1984, sponsored by the Federation of Behavioral, Psychological and Cognitive Sciences."

Looks at the "lines of argument and the evidence that were used in the reports of four major commissions on education . . . [and] contrasts these reports with some of the more recent studies of education." Argues that future policy should focus on: "improv[ing] the efficiency of instruction . . . rather than increasing the length of the school day or year; improv[ing] the quality and depth of the curriculum rather than mandate more courses . . . [and] improving the quality not quantity of the teaching staff."

Spady, William G., and Gary Marx. Excellence in our schools: making it happen. Arlington, Va., American Association of School Administrators, 1984. 32 p.

"A joint publication of the American Association of School Administrators and the Far West Laboratory."

Examines the recommendations that have been made in the numerous educational reform reports and makes suggestions for their implementation in the schools.

Symposium on the year of the reports: responses from the educational community. Harvard educational review, v. 54, Feb. 1984: 1-31.

Provides the views of seven educators as presented during the 1983-84 colloquia on schools concerning the reports and studies which focused on the shortcoming of the schools in the U.S.

* Twentieth Century Fund. Task Force on Federal Elementary and Secondary Education Policy. Making the grade: report. New York, The Fund, 1983. 174 p.

Tyler, Ralph W. A place called school. Phi Delta Kappan, v. 64, Mar. 1983: 462-464.

"Introduces Goodlad's final report, which provides 'a more comprehensive view of U.S. schools than any previously published.'"

* U.S. National Commission on Excellence in Education. A Nation at risk: the imperative for educational reform; a report to the Nation and the Secretary of Education, United States Department of Education. Washington, The Commission, 1983. 65 p.

Reports "that while we can take justifiable pride in what our schools and colleges have historically accomplished and contributed to the United States and the well-being of its people, the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people." Includes recommendations for making needed improvements.

Wright, A. Eugene. Reform proposals of the 1980s: revelations or resurrections? Clearing house, v. 57, Apr. 1984: 364-367.

Reviews the history of "several major education reform proposals" in the U.S. since 1749, and questions if "these [current] proposals are revelations in education signaling a true renaissance, or are they merely resurrections of 'revelations' from the past."

Yudof, Mark G. Educational policy research and the new consensus of the 1980s. Phi Delta Kappan, v. 65, Mar. 1984: 456-459.

Claims that "policy makers are using public opinion, not hard data, to stimulate change."

Zakariya, Sally Banks, and James L. Doud. Report on the Wingspread conference. Principal, v. 63, Mar. 1984: 57-63.

Reports on a conference of more than 40 educational experts which focused on questionning if there are "such things as 'standards of excellence' for elementary education;" and examined recent studies of schooling, including "A Nation at Risk."

II. SCHOOL EFFECTIVENESS AND QUALITY, TESTING, AND GENERAL ACHIEVEMENT

Alexander, Karl L. Comparing public and private school effectiveness: evidence and issues. Stanford, Calif., Institute for Research on Educational Finance and Governance, Stanford University, 1985. 56 p.

"P/NP 6"

"Prepared for the Conference Comparing Public and Private Schools . . . [held] on October 26-27, 1984."

Reviews "the evidence and issues surrounding Coleman, Hoffer and Kilgore's claim [in Public and Private Schools (1981)] that private secondary schools, in particular Catholic schools, are more effective than public schools in promoting cognitive development."

America's schools: public and private. Daedalus, v. 110, summer 1981: whole issue (167 p.)

Partial contents.--Conflict and consensus in American public education, by D. Tyack and E. Hansot.--Political coalitions for public education, by S. Bailey.--Loss of support for public secondary schools: some causes and solutions, by M. Kirst.--The moral function of the school, by J. Kagan.--Who will teach high school, by J. Atkin.--Literacy: a goal for secondary schools, by P. Graham.

Arnstine, Donald. The deterioration of secondary education: media images, administrative nostrums, and college pressures. Teachers College record, v. 85, fall 1983: 9-26.

Asserts that if there is a decline in the quality of high schools, it has been under way for more than a generation. States that "this gradual decline is not revealed in reductions in grade-point average or in aptitude scores. Rather, it is revealed in the very fact that the public has come to believe that the grade-point averages and aptitude scores signify anything at all of educational significance. The importance attached to these scores has resulted in policy decisions that focus students' attention on opportunities after high school, and distract their attention from the educational potential of their studies. But that the quality of a young person's future should be so dependent on these numerical scores suggests a broad cultural problem (and not just an educational one) that is far more serious than the issue of how high or low these scores are."

Brandt, Ron. Conflicting views on competency testing in Florida. Educational leadership, v. 36, Nov. 1978: 99-106.

Reports criticisms of the Florida Minimum Competencies Testing Program including the strategy chosen by Florida for achieving accountability and the hurried manner in which it was put into effect.

Chall, Jeanne S. Minimum competency in reading: an informal survey of the states. Phi Delta Kappan, v. 60, Jan. 1979: 351-352.

"An informal survey of the states was conducted recently on competency testing in reading. The responses indicated that most states are either giving competency tests, developing them, or making plans to do so."

Clark, Burton R. The high school and the university: what went wrong in America, parts 1-2. Phi Delta Kappan, v. 66, Feb. 1985: 391-397; Mar. 1985: 472-475.

In part 1 the author notes that "systems of education in other countries can serve as mirrors that offer different perspectives on education in the U.S. [He] uses cross-national comparisons as a means of shedding light on the 'dark side' of the relationship between secondary and higher education in the United States. We have created 'institutional biases' against excellence, he says. [In part 2] he suggests a long-term strategy of fundamental structural change that will serve to root out the 'sameness, rigidity, boredom, and alienation' that are the natural end products of our existing system of schooling."

* Cohen, David K., and Barbara Neufeld. The failure of high schools and the progress of education. In America's schools: public and private. Daedalus, v. 110, summer 1981: 69-89.

Contends that "the problems we see now are in good measure the result of past educational successes" in providing nearly equal access to elementary and secondary schools.

* The Condition of education, 1984; statistical report. Edited by Valena White Plisko. Washington, U.S. Dept. of Education, for sale by the Supt. of Docs., G.P.O., 1984. 228 p.

"NCES 84-401"

Partial contents.--Elementary/secondary education.--Higher education. --Vocational education: secondary and postsecondary participation.--Educationally disadvantaged adults.--Secondary education: student flows, course participation, and state requirements.

Davis, Bette, and Dorothy Arnof. How to fix what's wrong with our schools. New Haven, Conn., Ticknor & Fields, 1983. 181 p.

Partial contents.--Educational malpractice in reading.--Public pressure at work: competency and accountability.--Improving the odds on hiring good teachers.--What makes kids bad?

Dunlap, Howard G. Minimum competency testing and the slow learner. Educational leadership, v. 36, Feb. 1979: 327-329.

Contends that students in the 70-90 IQ range will be unfairly penalized if standards for competency tests are set at grade level or at "average" achievement levels.

Estimates of school statistics. Washington, National Education Association, 1985. 43 p.

"Presents current statistical information on public elementary and secondary education for the fifty states and the District of Columbia."

Factors associated with test score decline; briefing paper. Princeton, N. J., Educational Testing Service, 1984. 12 p.

"Prepared . . . for the U.S. Dept. of Education, National Center for Education Statistics."

"Describes changes in the characteristics of high school seniors, their families and home environment, the schools they attended, and their attitudes and behaviors; . . . documents changes in vocabulary, reading and mathematics test scores; . . . identifies those home and school processes and the student characteristics and behaviors that were related to the test score change; [and] . . . discusses the policy implications of these relationships."

Forbes, Roy H. Academic achievement of historically lower-achieving students during the Seventies. Phi Delta Kappan, v. 66, Apr. 1985: 542-544.

Concludes that "many things that happened in the Seventies could have dramatically affected student achievement in reading, among them: Title I, desegregation, sensitivity to serving students who had been underserved in the past, movements to improve public education in the southeastern states, and a focus on social concerns. Of these, any could have had a major impact on student performance. But the movement that stands out above all others during the Seventies is the effort to better educate the economically disadvantaged."

Frankel, Martin M., and Debra E. Gerald. Projections of education statistics to 1990-91. Washington, National Center for Education Statistics, 1982. 2 v. (166 p.)

"In this report, projections are presented for statistics on enrollments, graduates, teachers, and expenditures for the period of 1980-81 to 1990-91."

Contents.--I. Analytical report.--II. Methodological report.

Freeman, Donald J., Philip A. Cusick, and Richard F. Houang. Academic standards in secondary schools. [East Lansing, Mich.] Michigan State University, College of Education [1985] 17, 7 p.

Presents the results of a national survey of the attitudes of Americans towards "efforts to improve academic standards in secondary schools and . . . the public's willingness to bear the costs of standard-raising efforts."

Frizzell, Eric F. Functional literacy testing and the denial of high school diplomas in a post-desegregation setting: Debra P. v. Turlington. Rutgers law review, v. 33, winter 1981: 564-598.

Comment criticizes the narrowness of the court's decision in Debra P. v. Turlington. It also "suggest[s] the necessity of a more penetrating judicial exploration for discriminatory intent and the need for broader equitable relief in cases in which the practice of awarding high school diplomas contingent upon students passing a functional literacy test is challenged on fourteenth amendment grounds in a post-desegregation setting."

* Gallup, George H. The 16th Annual Gallup Poll of the public's attitudes toward the public schools. Phi Delta Kappan, v. 66, Sept. 1984: 23-38.

Reports the results of the annual survey which measures the attitudes of Americans toward their public schools.

Grading the schools. New York times, Apr. 10, 1983: 1, 44; Apr. 11: 1; Apr. 12: A1, D22; Apr. 13: A1, A22; Apr. 14: A1, A20.

Contents.--Students gain in basic skills but high school scores fail. --81% in poll say they would pay higher taxes to improve Nation's schools. --Questions on teachers' skills fuel debate over quality of education. --Non-Catholic Christian schools growing fast.--Schools try new ways to improve education.

Graham, Patricia Albjerg. Whither equality of educational opportunity? Daedalus, v. 109, summer 1980: 115-132.

Suggests that "the current expression of educational intent, equity, focuses attention on two factors: the school as the principal educational agency in the society; and literacy as the primary purpose of schooling."

Grant, W. Vance, and Thomas D. Syndier. Digest of education statistics, 1983-84. Washington, National Center for Education Statistics, for sale by the Supt. of Docs., G.P.O., 1984. 212 p.

"Contains information on a variety of subjects within the field of education statistics, including the number of schools and colleges, teachers, enrollments, graduates, educational attainment, finances, Federal funds for education, employment and income of graduates, libraries, and international education . . . . Included among the data appearing for the first time in the Digest are the following: State figures on the transportation of public school pupils; enrollment in public schools by grade span; a distribution of public schools by size of enrollment; schools, enrollment, staff, and finances in 120 of the Nation's largest school systems; trends in graduate enrollment in institutions of higher education; courses taken by participants in adult education; and data on the use of computers in public schools."

Greene, Leroy F. The State assessment question--an answer. Compact, v. 11, summer 1977: 5-8.

A California state assemblyman describes that State's educational system with its emphasis on prescribed proficiency standards for students, and its assessment programs designed to measure the achievement of individual schools.

Hechinger, Fred M. Turnaround for the public schools? Harvard business review, v. 63, Jan.-Feb. 1985: 136-144.

Urges businesses to support public education and reform priorities for overall educational excellence. Warns against illusory reforms, such as "stiffer requirements" or longer hours.

Holmes, C. Thomas, and Kenneth M. Matthews. The effects of nonpromotion on elementary and junior high school pupils: a meta-analysis. Review of educational research, v. 54, summer 1984: 225-236.

Concludes that "those who continue to retain pupils at grade level do so despite cumulative research evidence showing that the potential for negative effects consistently outweighs positive outcomes. Because this cumulative research evidence consistently points to negative effects of nonpromotion, the burden of proof legitimately falls on proponents of retention plans to show there is compelling logic indicating success of their plans when so many other plans have failed."

Husen, Torsten. Are standards in U.S. schools really lagging behind those in other countries. Phi Delta Kappan, v. 64, Mar. 1983: 455-461.

Analyzes how standards in U.S. schools compare with those of other countries. Argues "that low standards are not the most serious problem with public schooling--neither in the U.S. nor in other nations with comprehensive structures and high retention rates . . . . The real, and most serious, problem concerns the way formal education relates to a highly technical society--and the institutional contradictions and goal conflicts that beset the school operating in a highly competitive society where formal schooling increasingly influences social status and life chances."

Indicators of education status and trends. Prepared by the U.S. Dept. of Education and the National Center for Education Statistics. Washington, The Department, 1985. 43, 22 p.

Partial contents.--Student performance.--High school graduation rates. --Remedial course enrollment of college freshmen.--Fiscal resources.--Class size and pupil/teacher ratio.--Quality of the teaching force.--Teacher supply/demand and shortage.--Teacher earnings--comparisons with other occupations.--Public opinion ratings of schools.--Comparison, public/teacher opinion of problems.--School environment.--Student population characteristics.--Students enrollment by age.--State governance.

Kehres, Robert J. A model for accountability: education's double-edged sword. Clearing house, v. 51, May 1978: 449-453.

Comments on several accountability models currently under consideration as methods for evaluating the educational product. Proposes a new model based on an early assessment of a student's learning potential. This projection can then be measured at regular intervals against standardized achievement tests.

* Lerner, Barbara. American education: how are we doing? Public interest, no. 69, fall 1982: 59-82.

Reviews and analyses "available data on four of the most important questions about American education: How adequate are our educational resources and how fairly are they allocated? What are the cognitive achievement levels of our students in comparison to those of their foreign peers today and their domestic counterparts of yesteryear? What was the effect of open, versus traditional, schools on our students? And how has the American public assessed American education in recent decades?"

Leepson, Marc. Competency tests. [Washington] Editorial Research Reports, 1978. 603-620 p. (Editorial research reports, 1978, v. 2, no. 7)

Partial contents.--Setting academic standards.--Modern educational testing.--Future of competency tests.

Mahon, J. Patrick. Competency-based education--what are the legal issues? NASSP [National Association of Secondary School Principals] bulletin, v. 64, Feb. 1980: 98-106.

Observes that the implementation of competency-based education can raise legal issues in three areas. "First, there are the ever present legal issues related to constitutional claims under the rubric of due process. Secondly, there are legal issues related to claims of discrimination under the equal protection clause and its statutory counterparts. Finally, there are legal issues related to negligence."

* McCarthy, Martha M. The application of competency testing mandates to handicapped children. Harvard educational review, v. 53, May 1983: 146-164.

"Many states are facing the issue of how to apply minimum competency testing (MCT) mandates to handicapped students. Considers the legality of MCT diploma requirements applied to the handicapped in light of their constitutional and statutory rights to nondiscriminatory treatment, their statutory right to an appropriate education, and their constitutional right to substantive and procedural due process. Also offers a brief discussion of some unresolved legal issues surrounding the use of competency tests, including test validity, the controversy over individualized and standardized diploma requirements, and the identification of minimum competencies."

* Medway, Frederic J. To promote or not to promote? Principal, v. 64, Jan. 1985: 22-25.

Discusses the fluctuations in the attitudes of schools toward retention and the present call for the "reinstatement of strict, measureable promotion standards as a part of a renewed emphasis on basic skills;" and looks at the lack of agreement on promotion policies. Suggests the use of team decision-making and four alternative variations to traditional promotion and retention practices as a general approach to an "old dilemma."

National Assessment of Educational Progress 1969-1983: a bibliography of documents in the ERIC database. Edited by Theodore Pratt. Denver, Colo., National Assessment of Educational Progress, 1983. 236 p.

Oldenquist, Andrew. The decline of American education in the '60s and '70s. American education, v. 19, May 1983: 12-18.

Argues that the decline of American education has been caused by the failure of enforcing standards for all students.

Pinkney, H. B. The minimum competency movement in public education. Clearing house, v. 52, May 1979: 413-416.

Contends that "excuses or blame for children not having acquired the basic skills fail to justify the need for public schools' continued existence or continued funding. The public will continue to demand increased accountability in education. Such demands are coming from all sectors of the population." Argues that competency programs are an answer to these demands.

Rosenblatt, Jean. Post-Sputnick education. Washington, Congressional Quarterly 1982. 655-672 p. (Editorial research reports, 1982, v. 2, no. 9)

Contents.--Stock-taking after 25 years.--Education trends since 1957. --Debate over responsibilities.

School-college connection. NASSP [National Association of Secondary School Principals] bulletin, v. 68, Oct. 1984: 1-85.

Papers and recommendations from a national conference at Wingspread on Mar. 19-21, 1984, sponsored by "the American Association of Collegiate Registrars and Admissions Officers, the National Association of Secondary School Principals, and the American Council on Education."

Partial contents.--The college connection revisited: imitative processes and student expectations, by C. Adelman.--College admission requirements and the high school program, by S. Levine.--School-college partnerships: building effective models for collaboration, by F. Wilbur.--Impact of educational reforms on minorities and access to higher education, by J. Porter.--The role of tests in the transition from high school to college, by M. O'Keefe.

Standards for quality elementary schools: kindergarten through eighth grade. Reston, Va., National Association of Elementary School Principals, 1984. 60 p.

"States the position of the National Association of Elementary School Principals regarding the essential ingredients of a fine elementary or middle school. It combines the findings of current research on effective schooling with the practical, on-site experience of working principals."

* Stedman, Lawrence C., and Marshall S. Smith. Recent reform proposals for American eduation. Contemporary Education Review, v. 2, fall 1983: 85-104.

Looks at four of the 1983 reports which proposed major reforms in education and focuses on "the quality of the evidence for the poor state of American education; the claim that the U.S. education system is inferior to those of foreign countries; and the assumption that a high-technology (hi-tech) revolution is sweeping the American economic system." Academic performance, achievement, and standards are the emphasis of the discussion.

Thompson, Roger. Status of the schools. Washington, Congressional Quarterly, 1984. 611-632 p. (Editorial research reports, 1984, v. 2, no. 7)

Partial contents.--Calls for quality.--Course of change.--Making schools work.

Toch, Thomas. The dark side of the excellence movement. Phi Delta Kappan, v. 66, Nov. 1984: 173-176.

Looks at what is being done to help students who fail to meet the new and higher educational standards.

Tyler, Ralph W. What are the educational implications of minimum competency? National elementary principal, v. 58, Jan. 1979: 29-41.

Looks at minimum competency testing and notes that "many observers foresee a detrimental impact on schooling: a narrowing of the curriculum, the centralization of school governance, a new potential for resegregation, and the need for carefully constructed remediation programs--often when there are no funds to pay for them. And underlying these problems is the deeper concern that the students themselves will now bear the brunt of the public's latest push for educational accountability."

U.S. Office of Technology Assessment. Information technology and its impact on American education; summary. Washington, The Office [for sale by the Superintendent of Documents, G.P.O.] 1982. 23 p.

"Examines both the demands that the information revolution will make on education and the opportunities afforded by the new information technologies to meet these demands. Also examines how the application of information technologies may affect a broad range of educational providers.

Walker, N. William. Elementary school grade retention: avoiding abuses through systematic decision-making. Journal of research and development in education, v. 18, fall 1984: 1-6.

Contends that "the bulk of the literature on elementary school grade retention suggests that the possibility of noxious consequences is far more likely with retention than promotion." Recommends the use of procedures and policies which are systematic, consistent, and which reflect research findings, and suggests five steps which can minimize abuses of retention.

Willms, J. Douglas. Patterns of academic achievement in public and private schools: implications for public policy and future research. Stanford, Calif., Institute for Research on Educational Finance and Governance, Stanford University, 1985. 29, 7 p.

"P/NP 5"

"Prepared for the Conference Comparing Public and Private Schools . . . [held] on October 26-27, 1984."

Examines the questions: "to what extent do private school students perform better on academic achievement tests than public school students? [and] if there is a private schooling advantage, how much of it is associated with differences between public and private schools in their student intake, and how much is associated with differences in their schooling practices? . . . Also includes a separate analyses that examine sector differences for Blacks, Hispanics, and students from low socioeconomic backgrounds."

----- School effectiveness within the public and private sectors. Evaluation review, v. 8, Feb. 1984: 113-135.

"Employs data from the High School and Beyond study on approximately 30,000 sophomores in 1,000 U.S. high schools, provides estimates of school effectiveness for different types of students in different kinds of schools. The analysis shows that the range in school effectiveness within the two sectors far outweighs the differences between them."

Women and minorities in science and engineering. Washington, National Science Foundation, 1984. 182 p.

"NSF 84-300"

"Despite substantial gains over the past decade, women and minorities are still underrepresented in science and engineering, both in employment and in training."

III. ACHIEVEMENT AND CURRICULA PROBLEMS: LANGUAGE ARTS, MATHEMATICS, AND SCIENCE

American Federation of Teachers. AFT report on the math/science teacher shortage, curriculum standards, business involvement and computer activity. [Washington] The Federation [1984] 27 p.

Provides the results of a preliminary assessment of information in four basic areas: "the shortage itself; curriculum requirements in math and science; business-education (including union) relationships; and computer activity in the schools."

Blumenfeld, Samuel. The victims of "Dick and Jane." Reason, v. 14, Oct. 1982: 21-28.

"It has become obvious to me that what prevents America from seeking a real solution to the reading problem is its mindless adherence to the idea of state-monopoly education with all of its aggrandizement of bureaucrats, its celebration of the mediocre, its oppression of the free spirit, and its strident anti-intellectualism. You cannot achieve high individual literacy in a system that numbs the intellect, stifles intelligence, and reduces learning to the level of Mickey Mouse."

Boykin, Wilfred E. Trends for mathematics education. NASSP [National Association of Secondary School Principals] bulletin, v. 62, Dec. 1978: 101-109.

Reviews the events of the last 20 years in mathematics education and then offers some thought on the directions it will take.

The Crisis in literacy. Center magazine, v. 13, Nov.-Dec. 1980: 54-61.

"Six authorities on reading, writing, composition, and rhetoric look at the extent to which a literacy crisis exists in this country and discuss the meaning of literacy in a political society."

Eggerz, Solveig. The continuing crisis in American education: why Johnny still can't read--a review essay. Lincoln review, v. 2, winter-spring 1982: 31-37.

Examines the differences in reading ability between look-and-say and phonics-first students. Argues that "the ability to read is not being transmitted to a large number of children in American public schools."

Gibney, Thomas, and Edward Karns. Mathematics education--1955-1975: a summary of the findings. Educational leadership, v. 36, Feb. 1979: 356-359.

A national study of mathematics education reveals mostly traditional content, textbook teaching, and little supervision."

Glennon, Vincent J. Mathematics: how firm the foundations? Phi Delta Kappan, v. 57, Jan. 1976: 302-305.

"SAT scores and NAEP data suggest that the foundations are a bit shaky, so critics call for a return to the basics. The sensible approach, says Mr. Glennon, is to emphasize sequential, systematic, and structured teaching using many strongly individualized and humanized programs."

Holmes, Barbara J. Black students' performance in the national assessments of science and mathematics. Journal of Negro education, v. 51, fall 1982: 392-405.

"Presents results of a diagnostic analysis of achievement data for black students gathered in large-scale, national assessments of science and mathematics. The purpose of the analysis was to demonstrate the utility of assessment data for discovering where performance differentials exist between black and nonblack students. The outcome of the analysis is the identification of the taxonomic level and content area of exercises on which black students perform below students nationally."

* ----- Reading, science and mathematics trends: a closer look. Denver, Education Commission of the States, 1982. 19 p. (Report no. SY-RSM-50)

Highlights survey results which assessed achievement trends for students in particular grades and of a given age in order to examine the relationship between grade and performance and other factors.

Janko, Edmund. Diminished literacy: the clear and present danger. College Board review, no. 120, summer 1981: 13, 28-29.

Argues that there is an increase of diminished literacy developing in the schools.

Kozol, Jonathan. The crippling inheritance. New York times book review, Mar. 3, 1985: 1, 26-27.

Reviews some of the problems which plague society when illiterate children become illiterate adults.

----- Illiterate America. Garden City, N.Y., Anchor Press/Doubleday, 1985. 270 p.

Meek, Margaret. Achieving literacy: longitudinal studies of adolescents learning to read. London, Boston, Routledge & K. Paul, 1983. 232 p.

National Academy of Sciences (U.S.) Science and mathematics in the schools: report of a convocation. Washington, National Academy of Engineering, 1982. 32 p.

Reports on a national convocation held in May 1982, by the National Academies of Sciences and Engineering that considered the state of precollege education in science and mathematics in the U.S.

National Assessment of Educational Progress (Project). Reading change, 1970-75; summary volume. Denver, Education Commission of the States, 1978. 85 p. (Report no. 06-R-21)

"The reading ability of American students has changed between the 1970-71 and 1974-75 school years. But the change is neither entirely positive nor entirely negative. Instead, the changes are highly dependent on the age of the students and the type of reading required."

----- Reading comprehension of American youth: do they understand what they read? Denver, Education Commission of the States, 1982. 67 p.

Partial contents.--Perceptions, habits and experiences: do they relate to the reading performance of American students?.--Comprehensive written works: do American students understand what they read.--Comprehending different types of passages.--Applying study skills in reading.

----- Reading, thinking and writing: results from the 1979-80 national assessment of reading and literature. Denver [Education Commission of The States] 1981. 67 p. (Report no. 11-L-01)

"The national assessment of reading and literature employed a variety of techniques to examine students' ability to comprehend what they have read, including some tasks that asked for relatively extended discussion of text material."

----- Science technical report: summary volume. [Denver, Education Commission of the States] for sale by the Supt. of Docs., G.P.O., 1977. 134 p.

"The results of this study indicate that knowledge of fundamental scientific facts and principles as measured by National Assessment declined among American students between 1969 and 1973."

----- The third national mathematics assessment: results, trends and issues. Denver, Education Commission of the States, 1983. 55 p. (Report no. 13-MA-01)

"Nine-year-olds' overall performance was relatively stable over the nine years, neither declining nor improving significantly. Thirteen-year-olds' performance declined about 2 percentage points between the first two assessments and then improved more than 4 points between the second and third. Seventeen-year-olds' performance declined about 4 percentage points between the first and second assessments, and then stayed at about the same level between the second and third."

----- Three national assessments of reading: changes in performance, 1970-80. Denver, Education Commission of the States, 1981. 73 p. (Report no. 11-R-01)

Partial contents.--The reading performance of 9-year olds: national and group results.--The reading performance of 13-year-olds: national and group results.--The reading performance of 17-year-olds: national and group results. --Another look at national results: achievement class and racial/ethnic results by region.--A perspective on the results of the reading assessments.

----- Three national assessments of science: changes in achievement, 1969-77; selected results from the third national assessment of science. Denver, Education Commission of the States, 1978. 33 p. (Science report no. 08-S-00)

Reports on three assessments of achievement in science by American students. Assessments "were designed to establish how defined groups of American students respond to science exercises, rather than the performance level of individual students."

National Center for Education Statistics. Science achievement in the schools. [Washington, G.P.O.] 1978 [i.e. 1979] 56 p.

Uses statistics based on the 1976-77 school year and provides a comprehensive measure of scientific literacy of young Americans at ages 9, 13 and 17.

* Postman, Neil. The rising tide of illiteracy. Washington post book review, Mar. 31, 1985: 5.

Briefly looks at the histroy of literacy in America and reviews the book by Jonathan Kozol, "Illiterate America."

* Prescott, Peter S. When words are the enemy. Newsweek, v. 105, Mar. 11, 1985: 73.

Looks at the book "Illiterate America" by Jonathan Kozol and notes the authors' contention that the illiterate "is crippled in three ways: by his exclusion from society and commerce; by his ignorance of the past, which helps to explain his condition, and by his inability to express his dilemma through writing."

* Purves, Alan C. The potential and real achievement of U.S. students in school reading. American journal of education, v. 93, Nov. 1984: 82-106.

Finds a shortcoming in the reading comprehension competence of U.S. and foreign students.

----- Reading and literature: American achievement in international perspective. Urbana, Ill., National Council of Teachers of English, 1981. 247 p. (NCTE research report; no. 20)

Research in the language arts: language and schooling. Edited by Victor Froese and Stanley B. Straw. Baltimore, University Park Press, 1981. 319 p.

Reys, Robert E. Consumer math: just how knowledgeable are U.S. young adults? Phi Delta Kappan, v. 58, Nov. 1976: 258-260.

"National Assessment of Educational Progress studies show that a high percentage of young adults--even college graduates--can't balance a checkbook, use an income tax table, or apply simple math concepts in buying a can of tuna; these findings raise important curriculum questions."

* Rotberg, Iris C. A new perspective on math and science education. Phi Delta Kappan, v. 65, June 1984: 668-673.

"Recent studies of schooling tend to overstate or inadequately define the problems in mathematics and science education, claims the author. She suggests that we precisely define the problems we wish to solve and consider the implications of our solutions."

* ----- Some observations on the reported gap between American and Soviet educational standards. American education, v. 19, Jan.-Feb. 1983: 9-12.

Assesses the extent to which the reported gap in amount of math and science education taken in the Soviet Union exceeds the amount taken in the U.S.

* Rutherford, F. James. The dangerous decline in U.S. science education. Chronicle of higher education, v. 26, Apr. 13, 1983: 64.

Claims that "the deterioration of our system of science education is evidenced by declining test scores, fewer students at all levels electing to take courses in science and mathematics, and complaints from industry that employees have been insufficiently trained to carry out their work."

* Science and math education. New York, WNET/Thirteen, 1983. 7 p.
The MacNeil-Lehrer Report, Feb. 9, 1983.
Guests include Peggy Holliday, a school principal, Carl Sagan of Cornell University, T. H. Bell, Secretary of Education, and Ernest Boyer of the Carnegie Foundation for the Advancement of Teaching.

Scientific literacy. Daedalus, v. 112, spring 1983: whole issue (251 p.)
Partial contents.--Scientific literacy and economic productivity in international perspective, by H. Walberg.--Scientific illiteracy and democratic theory, by K. Prewitt.--Achieving wider scientific literacy, by A. Arons.--Science education: a framework for decision-makers, by M. Rowe.--The improvement of science teaching, by J. Atkin.--The case for computer literacy, by J. Kemeny.

Snow, Catherine E. Literacy and language: relationships during the preschool years. Harvard educational review, v. 53, May 1983: 165-189.
"Outlines the important similarities in the development of both language and literacy. The characteristics of parent-child interaction which support language acquisition--semantic contingency, scaffolding, accountability procedures, and the use of routines--also facilitate early reading and writing development. The author dismisses the explanation that variations in the level of literacy in the home are responsible for social class differences in school achievement."

The State of pre-college science education. Mosaic, v. 10, May-June 1979: 19-24.
"Two decades after Sputnik, a look at elementary and high school science instruction reveals many gaps still to be filled."

Stefanich, Greg, and Charles Dedrick. Addressing concerns in science and mathematics education: an alternative view. Clearing house, v. 58, Feb. 1985: 274-277.
"Addresses some of the major issues discussed in . . . ["A Nation at Risk: the Imperative for Educational Reform," report of the National Commission on Excellence in Education] as well as recommendations proposed in hearings before the Commission."

Stewart, Alva W. Illiteracy in America: a brief checklist. Monticello, Ill., Vance Bibliographies, 1984. 12 p. (Public administration series: bibliography P-1362)

* Sweet, David. Science and mathematics education in American high schools: results from the High School and Beyond study. [Washington] National Center for Education Statistics, 1984. 21 p.
Lists statistics for "the average number of years of science and mathematics; the percentages of students who had taken 3 or more years each of science and mathematics; the percentages of students who had earned credits in specific science and mathematics courses; and student attitudes toward mathematics."

U.S. National Science Foundation. National Science Board. Today's problems, tomorrow's crises. Washington, 1982. 8 p.

"CPCE-NSF-01"

"Improved preparation of all citizens in the fields of mathematics, science, and technology is essential to the development and maintenance of our Nation's economic strength, military security, commitment to the democratic ideal of an informed and participating citizenry, and leadership in mathematics, science and technology."

Walberg, Herbert J., and Shiow-Ling Tsai. Correlates of reading achievement and attitude: a national assessment study. Journal of educational research, v. 78, Jan.-Feb. 1985: 159-167.

"Reading achievement and attitude scores of a National Assessment of Educational Progress (NAEP) sample of 1,459 9-year-old students were multiply regressed on one another on home environment variables such as television watched, presence of newspapers, spare-time reading, dictionary use, kindergarten attendance, socioeconomic status, ethnicity, school characteristics, and other variables." Proposes use of such regression equations as a potential means to allow diagnoses of factors that produce educational outcomes.

Weiss, Iris R. Report of the 1977 national survey of science, mathematics, and social studies education. [Washington, U.S. National Science Foundation, Directorate for Science Education, Office of Program Integration] for sale by the Supt. of Docs., G.P.O., 1978. 1 v. (various pagings)

* Whitehead, Kenneth D. Foreign language study: one of the basics. American education, v. 19, Mar. 1983: 5-7, 14.

Contends that "the teaching of foreign languages should be emphasized in our schools."

IV. SOLUTIONS TO CURRICULA PROBLEMS

* Academic preparation for college: what students need to know and be able to do. New York, College Board, Office of Academic Affairs, 1983. 46 p.

Alexander, Karl L., and Aaron M. Pallas. Curriculum reform and school performance: an evaluation of the "new basics." American journal of education, v. 92, Aug. 1984: 391-420.

"The National Commission on Excellence in Education report proposed the imposition of a new high school curriculum, organized around 'Five New Basics.' Examines whether the commission's New Basics are likely to enhance levels of cognitive performance, which is the commission's central concern. . . . Concludes that the New Basics effectively promote generic verbal and quanititative skills. For this, the commission gets high marks. However, the commission fails to take stock comprehensively of the condition of American education."

Alternative courses for secondary school mathematics. Compiled by the Committee to Implement the Recommendations of An Agenda for Action. Reston, Va., National Council of Teachers of Mathematics, 1985. 57 p.

Gives course descriptions of 74 new mathematics courses for secondary school students which are categorized by focus (i.e., advanced consumer, business, computer, and integrated mathematics). Includes a brief review of improvements made in curriculum-design since the recommendations included in An Agenda for Action was issued by the National Council of Teachers of Mathematics in 1980.

American Federation of Teachers. An AFT statement on math and science education and the math and science teacher shortage. [Washington] The Federation, [1984] 24, 2 p.

Concludes that quality math and science education will require raising curriculum standards for all students, recruiting "new, high quality teachers," keeping "the best of those we have," and building alliances with the business world.

Aronowitz, Stanley. Toward redefining literacy. Social policy, v. 12, Sept-Oct. 1981: 53-55.

"The assumption that the literacy problem is greater now than it was 20, 30, or 50 years ago is unfounded."

Barkin, Florence, and Gail Guntermann. The case for learning foreign languages. Today's education, v. 71, Feb.-Mar. 1982: 46-49.

Contends that "among our nation's goals should be a strong commitment to fostering the teaching of languages."

Becoming a nation of readers: the report of the Commission on Reading. Washington, National Institute of Education [For sale by the Supt. of Docs., G.P.O.] 1985. 147 p.

Partial contents.--What is reading?--Emerging literacy.--Extending literacy.--The teacher and the classroom.--Testing and reading.--Teacher education and professional development.--Recommendations.

Boileau, Don M. Speaking/listening: much used, little taught. Curriculum report, v. 14, Dec. 1984: 1-8.

Discusses the importance for occupations, for citizenship, and for personal maintenance of oral communication. Suggests approaches for instruction in speaking and listening skills in secondary education.

Books in our future: a report from the Librarian of Congress to the Congress. Washington, [U.S. Congress] Joint Committee on the Library, for sale by the Supt. of Docs., G.P.O., 1984. 50 p. (Print, Senate, 98th Congress, 2nd session, joint committee print S. Prt. 98-231)

Asserts that our tradition as a culture of books and reading is "threatened by the twin menaces of illiteracy and aliteracy." Defines what citizens and government can do to promote literacy.

Brinckerhoff, Richard F. The current crisis in secondary school science education--and one response. NASSP [National Association of Secondary School Principals] bulletin, v. 66, Jan. 1982: 40-49.

"One wonders, says this writer, how American society--which depends so heavily on the works of science--can be so poor at conveying to its young people what science is all about. Recommendations resulting from a conference addressing that issue are presented here."

Burn, Barbara B., and James A. Perkins. International education in a troubled world. In New directions in international education. Philadelphia, American Academy of Political and Social Science, 1980. (Annals, v. 449, May 1980) p. 17-30.

"Expertise on the rest of the world is needed as never before in government, business, and especially in the universities. But the system for maintaining and strengthening this expertise is jeopardized by the erosion of financial support. Increasingly needed are specialists who combine foreign language and international studies expertise with training in professional fields, and specialists not only on other countries and geographic regions but also on major international issues such as energy and economic development. Paralleling the need for specialists is the need for greater international education for our citizens. This calls for much greater efforts in kindergarten through twelfth grade, in undergraduate studies, in foreign language teaching at all levels, and in adult and community education."

Carlson, Catherine Allen. Foreign languages: can U.S. foundations help bridge the gap? Foundation news, v. 21, July-Aug. 1980: 8-14, 39-40.

Summarizes some of the suggestions recently made by the President's Commission on Foreign Languages and International Studies for revitalizing foreign language programs in the United States. Discusses the potential benefits from such studies for the country and focuses on what foundations have done in the past in this field and what may be expected from them in the future.

Cazden, Courtney B. Language, literacy, and literature: putting it all together. National elementary principal, v. 57, Oct. 1977: 40-42.

Warns that the current approach in elementary schools of teaching language arts as discrete skills, i.e. spelling, grammar, composition, results in children learning the tools of communication but not their application. Contends that language arts should be integrated into all areas of the curriculum in the form of speaking, listening, reading, and writing if the basic skills are to have meaning for the student.

Changed lives: the effects of the Perry preschool program on youths through age 19. Ypsilanti, Mich., High/Scope Press, 1984. 210 p. (Monographs of the High/Scope Educational Research Foundation, no. 8)

Represents the eighth report on a longitudinal study of 123 black youths from low income families which is exploring the long-term effects on these young people of participation versus nonparticipation in a program of high quality early childhood education (the Headstart program). "Results to age 19 indicate lasting beneficial effects of preschool education in improving cognitive performance during early childhood; in improving scholastic placement and achievement during the school years; in decreasing delinquency and crime, the use of welfare assistance, and the incidence of teenage pregnancy; and in increasing high school graduation rates and the frequency of enrollment in postsecondary programs and employment."

Computing and mathematics: the impact on secondary school curricula: report of a conference sponsored by the National Science Foundation. Edited by James T. Fey. [Reston, Va.] National Council of Teachers of Mathematics, 1984. 100 p.

Conrad, Kendon J., and Maurice J. Eash. Measuring implementation and multiple outcomes in a child parent center compensatory education program. American educational research journal, v. 20, summer 1983: 221-236.

"Reports an evaluative study of a Child Parent Center Compensatory Education Program delivered to a population marked by low achievement and high incidence of social problems. The 2-year study included classroom observation measures of program implementation and examined the results of specific program characteristics and parent involvement as they affected achievement, locus of control, and home environment. Based on a quasi-experimental study of over 500 children and 120 parents, the program increased achievement, promoted greater feeling of being in control of one's life, and stimulated parent involvement in school and interest in the child's educational development."

Crawford-Lange, Linda M. Foreign language enrollments: why are they declining? What can be done? NASSP [National Association of Secondary School Principals] bulletin, v. 69, Feb. 1985: 14-21.

"Despite renewed emphasis on the importance of foreign languages, enrollment in these classes continues to decline. This principal believes the reason is faulty marketing. With the help of a survey, she describes what other principals believe."

* De Bevoise, Wynn. Education and technology: predicting the needs of the future. R&D perspectives, fall 1982: whole issue (8 p.)

"In reviewing research on the effects of technology on skill requirements, this article attempts to identify those skills needed generally and those skills that are peculiar to higher level jobs. It then suggests implications for curricular programs based on these needs."

Fennell, Francis M. Elementary mathematics: priorities for the 1980's. Bloomington, Ind., Phi Delta Kappa Educational Foundation, 1981. 29 p.

Forsythe, Thomas. Soaking it up in Milwaukee. American education, v. 17, July 1981: 21-25.

"A second language is just part of growing up at Milwaukee's language immersion magnet school."

Franchine, Phillip. Chicago taps language wealth. American education, v. 16, May 1980: 8, 10-15.

Describes a program in the Chicago schools which "gives students credit for languages learned outside the classroom and offers independent study in the less commonly taught languages."

Gardner, Eileen. Closing the math and science gap. Washington, Heritage Foundation, 1983. 12 p. (Backgrounder no. 265)
Concludes that "recommended solutions are: redefined teacher certification requirements; teacher accreditation through testing of general intelligence and knowledge in specific areas; performance- and need-based salaries; withdrawal of federal mandates; and limited federal funding of education."

Guthrie, John T., and Irwin S. Kirsch. The emergent perspective on literacy. Phi Delta Kappan, v. 65, Jan. 1984: 351-355.
"A traditional approach to the problem of illiteracy will continue to lead to inappropriate evaluations of literacy and to inefficient education. The authors urge us to adopt a new perspective."

Hawkins, Lee E. Foreign language study and the Federal role. NASSP [National Association of Secondary School Principals] bulletin, v. 65, Nov. 1981: 87-92.
Argues that "the study of languages should join English, physical education, math, and consumerism as a required course of study in the public schools of the United States." Suggests that the States handle the necessary legislation without intervention on the part of the Federal Government.

* High schools and the changing workplace: the employers' view: report of the Panel on Secondary School Education for the Changing Workplace; National Academy of Sciences; National Academy of Engineering; Institute of Medicine; Committee on Science, Engineering, and Public Policy. Washington, National Academy Press, 1984. 50 p.
This report's "sole objective is to identify, from the employer's perspective, the basic education needed for effective, upwardly mobile, lifelong participation in the American work force."

Holden, Constance. Companies move to rescue school science. Science, v. 225, Sept. 28, 1984: 1456-1457.
Reports on corporate partnerships with high schools and the growing interest of industries for improvements in scientific education.

* Indicators of precollege education in science and mathematics: a preliminary review. Edited by Senta A. Raizen and Lyle V. Jones; [sponsored by the] Committee on Indicators of Precollege Science and Mathematics Education, Commission on Behavioral and Social Sciences and Education, and the National Research Council. Washington, National Academy Press, 1985. 200 p.

Lerner, Barbara. Vouchers for literacy: second chance legislation. Phi Delta Kappan, v. 63, Dec. 1981: 252-255.
Proposes a plan that would "let each family have the option of sending their child to the private school of their choice at taxpayer expense if--and only if--he or she fails to achieve literacy in the public schools, as defined by local standards of minimum competence, for three years in a row."

Marvin, Carolyn, and Mark Winther. Computer-ease: a twentieth-century literacy emergent. Journal of communication, v. 33, winter 1983: 92-108.
"The history of written literacy and a survey of user experiences with computing suggest that, without public commitment of social and economic resources, innovations in computer technology may serve to exacerbate the current inequities in the distribution of literacy skills."

McPhail, Irving P. Computer inequities in school uses of microcomputers: policy implications. Journal of Negro education, v. 54, winter 1985: 3-13.

Briefly summarizes the findings of two national studies of computer inequity in the Nation's schools: "a University of Minnesota study done for the National Science Foundation and The Johns Hopkins University Center for Social Organization of School's National Survey of School Uses of Microcomputers . . . . Also discusses the implications for education policy that emerge from a consideration of computer inequities in opportunities for computer literacy."

Mechling, Kenneth R. Taking charge: how principals can improve school science programs. Principal, v. 62, Jan. 1983: 16-21.

Describes the roles that a school principal can use to improve the science education in his school. These include becoming an advocate for the subject and process of science, and examining the science curriculum and considering changing it.

Mullin, Stephen P., and Anita A. Summers. Is more better? The effectiveness of spending on compensatory education. Phi Delta Kappan, v. 64, Jan. 1983: 339-347.

Reports the findings of 47 studies on the overall effectiveness of compensatory education. Concludes that "the programs have a positive, though small, effect on the achievement of disadvantaged students; the results of most studies are overstated because of the upward biases inherent in several standard statistical procedures; [and] the gains appear to be greater in earlier years, and the evidence is fairly strong that early gains are not sustained."

Ornstein, Allan C., and Daniel U. Levine. Compensatory education: can it be successful? What are the issues? NASSP [National Association of Secondary School Principals] bulletin, v. 65, May 1981: 1-15.

"Evidence shows that compensatory education can be successful; but, the writers warn, there are still many questions concerning its effectiveness. They discuss the situation, they ask questions, and they explore the possibilities."

Pearson, Craig. The main event: reading vs. reading skills. Learning, v. 9, Nov. 1980: 28-30.

Warns that the systems approach to reading currently used in the majority of the nation's classrooms, is "turning teachers into technicians and children into worksheet-completing robots." Meanwhile children read less and less on their own and S.A.T. scores continue to drop. Discusses two alternative programs for teaching reading which have been used successfully in North Carolina and Pennsylvania.

Penick, John E., and Robert E. Yager. The Search for Excellence in science education. Phi Delta Kappan, v. 64, May 1983: 621-623.

"Examines the Search for Excellence [project] which identified exemplary science programs throughout the U.S."

Rhodes, Nancy C. Are languages making a comeback? Principal, v. 62, Mar. 1983: 24-28.

Contends that "elementary school foreign language learning is making a modest comeback. Nothing spectacular, but steady and sure."

Roy, Kenneth Russell. Nine tough questions you should be asking about elementary school science. American school board journal, v. 172, Apr. 1985: 39, 44.

Discusses assessment criteria for strong school science programs.

Schwartz, Judah L., and Jerrold R. Zacharias. Science, mathematics, and technology: recognizing the quantitative arts. National elementary principal, v. 57, Oct. 1977: 87-93.
Describes the answers which elementary and middle school principals gave to questions concerning curriculum content in the areas of science, mathematics, and technology. Most of them agreed that subject matter should be secondary to teaching the process of critical thinking, that there should not be a national curriculum, that teaching in these areas should begin at an early age, that science and math curriculums should be interrelated, and that any method of teaching is valid if it is successful.

Short, Edmund C. Strengthening the curriculum: eight policy recommendations. Educational forum, v. 49, spring 1985: 351-360.
Suggests "eight ideas for altering curriculum content which have their sources in what may be considered distortions in the way we often conceive of key ideas: truth, literacy, education, knowledge, citizenship, democracy, government, and our social ideals."

Skerry, Peter. The charmed life of Head Start. Public interest, no. 73, fall 1983: 18-39.
Examines the Head Start program from a number of viewpoints: the liberal perspective, as a community institution, and its relationship with the Black community.

Thomas, Thomas C., and Sol H. Pelavin. Patterns in ESEA title I reading achievement. Menlo Park, Calif., Stanford Research Institute, 1976. 110 p.

Thompson, Richard T. New directions in foreign language study. In New directions in international education. Philadelphia, American Academy of Political and Social Science, 1980. (Annals, v. 449, May 1980) p. 44-55.
Suggests three steps: "encourage every elementary and secondary school in the country to offer a full sequence of instruction in at least one language; from this broader base begin a process of 'winnowing' whereby the students with superior talent are identified and encouraged to pursue further serious study in bilingual schools or international high schools."

Thompson, Roger. Illiteracy in America. [Washington, Congressional Quarterly] 1983. 475-492 p. (Editorial research reports, 1983, v. 1, no. 24)
Partial contents.--Its extent and consequence.--Search for causes, remedies.--Remedial efforts under way.

* Wilson, Jack M., and Tim C. Ingoldsby. Places where things are right. Physics today, v. 36, Sept. 1983: 52-57, 60.
"Analysis of the reasons for the success of a number outstanding high-school programs in physics suggests a set of conditions for creating successful programs at other schools."

* Wirszup, Izaak. Education and national survival: confronting the mathematics and science crisis in American schools. Educational leadership, v. 41, Dec. 1983-Jan. 1984: 4-11.
Contends that resolving the educational crisis "will mean raising the nation's general level of educational achievement by some three to four years; . . . [and] will require a sustained effort by all segments of our society, private and public investment, and, above all, imaginative and engaged leadership at all levels of government." Makes nineteen recommendations for curricula reforms and long-term structural changes.

Wooten, Richard H. Compensatory language education—a bridge for the disadvantaged. NASSP [National Association of Secondary School Principals] bulletin, v. 59, Dec. 1975: 101-105.
Urges compensatory lanugage training for those speaking non-standard English.

Yager, Robert E. Science education for a new era. Environment, v. 25, Dec. 1983: 17-23.
Suggests directions for science education in the United States. Warns "we can no longer afford a citizenry that is illiterate in matters of science and technology."

V. TEACHERS, SCHOOL ADMINISTRATION, AND SCHOOL FINANCE

Augenblick, John. The States and school finance: looking back and looking ahead. Phi Delta Kappan, v. 66, Nov. 1984: 196-201.

Assesses recent changes in methods of support for local school finance and the relationship of school reform to school finance.

Bell, T. H. Building a better teacher profession. American education, Mar. 1983: 2-4.

"Secretary Bell explains why he thinks a position of 'master teacher' would help raise the esteem in which teachers are held and attract more highly qualified students to teaching careers."

Bloom, Benjamin S. The master teachers. Phi Delta Kappan, v. 64, June 1982: 664-668, 715.

Emphasizes the idea that "master teachers play an important role in the development of talent in many fields. Here Mr. Bloom examines the characteristics of master teachers of pianists and Olympic swimmers and finds many commonalities that have implications for all of education."

Cornett, Lynn. State actions: career ladders and other incentive plans for school teachers and administrators. Atlanta, Southern Regional Education Board, 1984. 15 p.

Presents "brief summaries of state actions relating to incentive plans for teachers and administrators along with names of some state contact persons. Information on 41 states is included. In several of the nine states not included, the issue is being discussed, but there were no reports of specific proposals or actions."

* Darling-Hammond, Linda. Beyond the commission reports: the coming crisis in teaching. Santa Monica, Calif., Rand Corporation, 1984. 19 p. (Rand/R-3177-RC)

Suggests that both "upgrading teacher compensation and creating more professional working conditions are part of a structural solution . . . that addresses the interrelated causes of the teacher supply and quality problems."

Doyle, Denis P., and Chester E. Finn, Jr. American schools and the future of local control. Public interest, no. 77, fall 1984: 77-95.

Contends that "local control of public education as conventionally defined is an antiquated doctrine" and that "the primary source of fiscal and political energy in the public education system is to be found in the state capital."

Draba, Robert E., and Lesley Linde Steinkellner. Screening applicants for teacher training. Educational forum, v. 42, Nov. 1977: 101-109.

Proposes a way to define basic reading competencies on the part of teachers and suggests how this definition might "be used as a selection criterion to screen applicants for teacher training programs."

* Feistritzer, C. Emily. The making of a teacher: a report on teacher education and certification. Washington, National Center for Education Information, 1984. 64 p.

  Contents.--Number of prospective teachers.--Admission into teacher education.--Teacher education students.--Graduation from teacher education.--Institutions preparing teachers.--Certification of teachers.--The future of teaching.

Finn, Chester E., Jr. Teacher unions and school quality: potential allies or inevitable foes? Phi Delta Kappan, v. 66, Jan. 1985: 331-338.

"Examines the background of teacher unionism, details the rivalry between the National Educational Association and the American Federation of Teachers, and pays particular attention to the unions' response to the 'excellence movement' of the Eighties."

* Gallup, Alec. The Gallup poll of teachers' attitudes toward the public schools. Parts 1-2. Phi Delta Kappan, v. 66, Oct. 1984: 97-107; Jan. 1985: 323-330.

Surveyed teacher attitudes on the public schools in order to establish a benchmark from which to track opinion trends and "to compare teacher attitudes about key topics with the views of the general public, including parents of children enrolled in the public schools."

* Goertz, Margaret E., Ruth B. Ekstrom, and Richard J. Coley. The impact of State policy on entrance into the teaching profession; final report. Princeton, N.J., Educational Testing Service, Div. of Education Policy Research and Services, 1984. 179, 13 p.

"NIE Grant no. G83-0073"

"Submitted to National Institute of Education, Education Policy and Organization."

"Describes polices used by States to regulate entrance into the teaching profession and collects information on the impact of these policies."

* Good, Thomas L., and Gail M. Hinkel. Teacher shortage in science and mathematics; myths, realities, and research. Washington, National Institute of Education, 1983. 49 p.

"A summary of a conference sponsored by the National Institute of Education, in Washington, D.C., February 10-11, 1983.

Partial contents.--Research, review and analytical papers.--Case studies: school responses to the teacher shortage.--Case studies: business/community/education relationships.--Directions for action.

Grassmuck, George. White House conferences and education funding. Presidential studies quarterly, v. 14, spring 1984: 189-208.

Examines the purposes, goals, organization, procedures and results of the White House Conference on Rural Education (1944) and the two White House Conferences on Education (1955 and 1965), focusing on their role in achieving Federal aid to education.

Kirst, Michael W. The changing balance in State and local power to control educaton. Phi Delta Kappan, v. 66, Nov. 1984: 189-191.

"A restructuring of Federal, state, and local relations is ceding considerably more control of education to the states. This spurt in state activity comes at the end of a decade of steady growth in state control. The author speculates on the new state initiative."

----- Who controls our schools? American values in conflict. New York, W. H. Freeman, 1984. 183 p.
Contents.—Is something wrong with our schools?—Cycles of reform—crises in education.—The common school—its establishment and reform.—From Sputnik to the war on poverty.—How well do our schools perform?—Dollars and decisions.—Who shapes the curriculum?—Renewing the teaching profession.—Looking ahead.

* Levin, Henry M. Solving the shortage of mathematics and science teachers. Stanford, Calif., Institute for Research on Educational Finance and Governance, Stanford University, 1985. 24 p.
"Project report no. 85-A2"
Concludes that "it is only by providing special increments to attract mathematics and science specialists that a long-term solution can be effected. Schools can accommodate such a change in policy through careful and systematic planning. Both the State and Federal governments have roles to play in assisting schools to provide salary policies that will attract adequate numbers of qualified teachers for all openings."

Lieberman, Myron. Teacher unions and educational quality: folklore by Finn. Phi Delta Kappan, v. 66, Jan. 1985: 341-343.
Argues that "the real question is not whether teacher unions will continue to exist but whether they will exist as a dominant force in educational policy making. For a least two reasons, the answer is far from clear."

Merit pay/master teachers. New York, WNET/Thirteen, 1983. 8 p.
The MacNeil-Lehrer Report, June 6, 1983.
Guests include T. H. Bell, Secretary of Education, Willard McGuire of the National Education Association, Lamar Alexander, Governor of Tennessee, and Ann Robertson, a teacher.

Miklos, Mary Oellerich Dalnoki. Preparation for criterion-referenced tests, a brief review of scientific competencies for teachers of middle grades. Washington, University Press of America, 1982. 233 p.

Nelson, F. Howard. New perspectives on the teacher quality debate: empirical evidence from the National Longitudinal Survey. Journal of education research, v. 78, Jan.-Feb. 1985: 133-140.
Found that "less than 25% of teachers in the NLS National Longitudinal Survey sample planned education majors as seniors in high school, suggesting that some public policy may be fallaciously guided by widely cited research based only on the study of prospective education majors among the college bound."

* Odden, Allan. Education finance in the States: 1984. Denver, Education Commission of the States, 1984. 33 p.
Partial contents.—The changing fiscal and political context.—Education reform in eight States.—The political economy of educational reform.—The new school finance.

----- Financing educational excellence. Phi Delta Kappan, v. 65, Jan. 1984: 311-318.
Outlines the functions and programs needed, estimates the costs, analyzes the differences between financing excellence and financing fiscal equity, and compares the politics of excellence and equity in school finance.

Palaich, Robert. Strategies: State strategies to improve teaching. Denver, Colo., Education Commission of the States, 1985. 20 p. (No. TQ84-5)
"Explores the state leadership/local control boundary and suggests how state policy can encourage local strategies to improve teaching."

Some contemporary problems in mathematics education. Journal of research and development in education, v. 15, summer 1982: 1-89.
Partial contents.--On humanistic alternatives in the practice of teacher education, by S. Brown.--Research on teacher education: a philosophical orientation, by C. Brown and T. Cooney.--Mathematical literacy and teacher education, by A. Osborne.--Reflections on secondary mathematics teacher education program: responses from a survey, by W. Bush and E. Davis.

Survey on master teachers. Atlanta, Southern Regional Education Board, 1982. 28 p.
Presents the results of a survey of 50 State departments of education about existing policies on master teachers. Policy areas of concern for the survey included policies on selecting supervising teachers; recognition of outstanding teachers; extra pay for supervising teachers and for outstanding performance; and certification requirements and inservice training for supervising teachers.

Teacher education policy in the States: 50-State survey of legislative and administrative actions. Washington, American Association of Colleges for Teacher Education, 1985. ca. 110 p.
Reports survey results of the 50 States concerning their initiatives in nine education policy areas. Areas include standards for admissions; incentives for recruitment and retention; curricula; faculty development; professional development or inservice opportunities for practitioners; and evidence of maintenance of equity.

Troisi, Nicholas F. Effective teaching and student achievement. Reston, Va., National Association of Secondary School Principals, 1983. 12 p.
Examines the literature on effective teaching.

U.S. General Accounting Office. New directions for Federal programs to aid mathematics and science teaching; report. Washington, G.A.O., 1984. 86 p.
"GAO/PEMD-84-5, Mar. 6, 1984"
"GAO does not find evidence that training programs to upgrade existing mathematics and science teachers will produce results in the terms of improved student achievement."

U.S. National Commission for Excellence in Teacher Education. A call for change in teacher education. Washington, American Association of Colleges for Teacher Education, 1985. 56 p.
"Highlights five related issues: supply and demand for quality teachers, content of teacher education programs, accountability for teacher education, resource requirements for teacher education programs, and conditions necessary to support the highest quality of teaching. A broad analysis of each of the issues is provided, supported by selected empirical findings. Finally, a series of sixteen recommendations is proposed to address the need for change and improvement."

VI. CONGRESSIONAL PUBLICATIONS: HEARINGS, REPORTS, AND STUDIES

U.S. Congress. House. Committee on Education and Labor. Subcommittee on Elementary, Secondary, and Vocational Education. Foreign Language Assistance for National Security Act. Hearing, 98th Congress, 1st session, on H.R. 2708. May 9, 1983. Washington, G.P.O., 1983. 40 p.

----- Hearings on Secondary Schools Basic Skills Act. Hearings, 98th Congress, 2nd session, on H.R. 5749. June 12-13, 1984. Washington, G.P.O., 1984. 95 p.

----- Needs of elementary and secondary education in the 1980s; a compendium of policy papers. Washington, G.P.O., 1980. 693 p.
At head of title: 96th Congress, 2d session. Committee print.

----- Oversight hearing on reading and writing achievement. Hearing, 97th Congress, 1st session. May 7, 1981. Washington, G.P.O., 1981. 102 p.

----- Oversight on the quality of education in the United States (parts 1-2). Hearing, 98th Congress, 1st session. Washington, G.P.O., 1983. 392, 601 p.
Hearings held May 12-June 29, 1983.

----- Part 7: Special Projects Act and miscellaneous programs. Hearings, 95th Congress, 1st session, on H.R. 15. July 13, 14, 19, 20, 1977. Washington, G.P.O, 1977. 827 p.

----- Part 22: biomedical enrichment programs for disadvantaged secondary school students. Hearing, 95th Congress, 2d session, on H.R. 10736. Mar. 2, 1978. Washington, G.P.O., 1978. 111 p.

U.S. Congress. House. Committee on Education and Labor. Subcommittee on Postsecondary Education. Illiteracy and the scope of the problem in this country. Hearing, 97th Congress, 2nd session. Sept. 21, 1982. Washington, G.P.O., 1984. 83 p.

----- National security and economic growth through foreign language improvement. Hearings, 97th Congress, 1st session, on H.R. 3231. Washington, G.P.O., 1981. 225 p.
Hearings held in Washington, D.C., on July 14-15; New Haven, Conn., Sept. 25, 1981.

U.S. Congress. House. Committee on Education and Labor. Subcommittee on Select Education. Hearings on foreign language and international studies. Hearings, 96th Congress, 2d session, on H. Con. Res. 301. Sept. 10 and 17, 1980. Washington, G.P.O., 1980. 134 p.

U.S. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research and Technology. Science and math education. Hearing, 98th Congress, 2nd session. Feb. 10, 1984. [Washington, G.P.O.] 1984. 231 p.
"No. 128"

----- Secondary math and science education. Hearings, 97th Congress, 2nd session. May 7, 1982. [Washington, G.P.O.] 1983. 127 p.
"No. 169"

U.S. Congress. House. Committee on the Budget. Task Force on Education and Employment. Education quality and Federal policy. Hearings, 98th Congress, 1st session. Parts 1-3. Washington, G.P.O., 1983. 3 v.
Hearings held June 21-30, 1983.
"Serial no. TF4-5"
"Joint task force/subcommittee hearing between the Budget Committee and the Education and Labor Committee."

U.S. Congress. House. Select Committee on Children, Youth and Families. Improving American education: roles for parents. Hearing, 98th Congress, 2nd session. June 7, 1984. Washington, G.P.O., 1984. 123 p.

U.S. Congress. Joint Economic Committee. Subcommittee on Economic Goals and Intergovernmental Policy. International student achievement comparisons and teacher shortages in math and science. Hearing, 98th Congress, 1st session. June 15, 1983. Washington, G.P.O., 1983. 122 p. (Hearing, Senate, 98th Congress, 1st session, S. Hrg. 98-508)

U.S. Congress. Senate. Committee on Labor and Human Resources. Education for Economic Security Act; report to accompany S. 1285. [Washington, G.P.O.] 1983. 42 p. (Report, Senate, 98th Congress, 1st session, no. 98-151)

----- Quality of education, 1983. Hearings, 98th Congress, 1st session, on examination of the report of the President's Commission on Excellence in Education. Parts 1-2. Washington, G.P.O., 1984. 2 v. (673 p.) (Hearings, Senate, 98th Congress, 1st session, S. Hrg. 98-562, parts 1-2)
Hearings held Aug. 18, Sept. 6, Oct. 19, Nov. 2 and 9, 1983.

----- Review of mathematics and science education programs, 1983. Hearing, 98th Congress, 1st session. Apr. 18, 1983. Washington, G.P.O., 1984. 171 p. (Hearing, Senate, 98th Congress, 1st session, S. Hrg. 98-524)

U.S. Congress. Senate. Committee on Labor and Human Resources. Subcommittee on Education, Arts and Humanities. Oversight of quality in education: report of the National Commission on Excellence in Education. Hearings, 98th Congress, 1st session. Washington, G.P.O., 1984. 612 p. (Hearings, Senate, 98th Congress, 1st session, S. Hrg. 98-593)
Hearings held July 21-Sept. 29, 1983.

RESEARCH GUIDE

EDUCATION: A GUIDE TO SOURCES OF INFORMATION

by
Saundra Shirley-Reynolds
Bibliographer, Education and Public Welfare
Library Services Division

August 1985

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References to selected commercial databases and vendors are identified in the text. Such sources as DIALOG, BRS, SDC/Orbit, NEXIS/LEXIS, and Wilsonline are among the more prominent which are commercially available.

RESEARCH SOURCES

This is a listing of research tools described in this guide and pages where they are mentioned.

AIM/ARM (Abstracts of Instructional Materials/ Abstracts of Research Materials) 7
American Educators' Encyclopedia 9
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New York Times Index 5
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Projections of Education Statistics to 1990-1991 10
Public Affairs Information Service (PAIS) 2
Readers' Guide to Periodical Literature 2
Resources in Education (RIE) 8
Review of Research in Education 12
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Standard Education Almanac 12
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Teacher Effectiveness: An Annotated Bibliography and Guide
  to Research 12
Washington Information Directory 13
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PART I: GENERAL REFERENCE SOURCES

APPROPRIATE SEARCH TERMS USED MOST FREQUENTLY ARE "EDUCATION" AND TERMS BEGINNING WITH THE WORDS EDUCATION OR EDUCATIONAL, UNLESS OTHERWISE INDICATED.

BOOKS

Library of Congress subject headings are used in many library catalogs, nationwide. The subject heading "Education" and subject headings beginning with the words Education or Educational may be used to identify books in the Library of Congress catalog, and other library catalogs.

JOURNAL ARTICLES

Citations to journal articles and other materials about education can be found in a number of printed indexes and online bibliographic databases. The materials covered by the printed indexes are briefly described here.

Online bibliographic databases enable the researcher to locate citations to journal articles and other materials by using a computer terminal to search a machine-readable file. Search terms may be combined in ways that are impossible in a printed index or a library catalog, and the equivalent of many volumes of indexing can be scanned in minutes. The availability of various printed indexes online is indicated in the description of the tools, although all vendors of a specific file may not be listed. Since the development of online information retrieval systems is dynamic, it may be desirable to consult a librarian or information systems specialist for current information on database access and charges.

> BUSINESS PERIODICALS INDEX

Business Periodicals Index includes articles appearing in English language business periodicals. The Index is issued monthly and cumulated quarterly and annually. It is also available online through Wilsonline.

> MAGAZINE INDEX

Magazine Index, a microfilm service, provides citations to materials in over 400 popular magazines, focusing on coverage of current affairs, leisure time activities, arts, sports, and science and technology. The Index is available online commercially through the DIALOG Information Retrieval Service as file 47.

> PUBLIC AFFAIRS INFORMATION SERVICE BULLETIN (PAIS)

PAIS is a subject index of books, pamphlets, government publications, reports of public and private agencies, and periodical articles relating to economic and social conditions, public administration, and international relations. PAIS is also available online commercially as file 49 in the DIALOG Information Retrieval Service.

> READERS' GUIDE TO PERIODICAL LITERATURE

The Readers' Guide is an author/subject index to periodicals of general interest published in the U.S. It is published monthly with quarterly and annual cumulations. The Index is also available online in Wilsonline.

> SOCIAL SCIENCE CITATION INDEX

Social Science Citation Index is "an international interdisciplinary index to the literature of the social sciences" in more than 1500 journals. It includes citation, source, corporate address, and Permuterm subject indexes. This index is normally more current than the other printed indexes, but subject access is limited to the significant words contained in the titles of the works indexed. The Index is available online as Social Scisearch, file 7, in the DIALOG Information Retrieval Service.

> SOCIAL SCIENCES INDEX

Social Sciences Index consists of author and subject entries to articles in more than 250 periodicals. Coverage includes the fields of education, law and criminology, economics, psychology, sociology, and political science. It is published quarterly with annual cumulations. The Index is also available through the Wilsonline.

LEGISLATIVE INFORMATION

Congressional publications, including hearings and committee prints, concerning education issues may be identified by searching the following sources; and may be found in the collections of Government depository libraries.

> CIS INDEX (Index to the Publications of the United States Congress)

The CIS Index, produced by the Congressional Information Service, abstracts all congressional publications with the exception of the Congressional Record. The Index is published monthly and cumulated quarterly and annually. Each issue of the Index is divided into index and abstract portions. CIS Index is also available online commercially, through DIALOG file 101.

> CONGRESSIONAL QUARTERLY WEEKLY REPORT

Congressional Quarterly Weekly Report provides current information on congressional activities, the progress of major bills, and background information on major policy issues. Important recent articles are indexed on the back cover of each issue. A quarterly and an annual index are also issued. Congressional Quarterly also publishes an annual entitled CQ Almanac, which cumulates the weekly reports. Congressional Quarterly Weekly Report is available online through NEXIS.

> CONGRESSIONAL RECORD

The Congressional Record provides an edited transcript of the activities on the floor of the House and the Senate. It is published each day Congress is in session. Subject and name indexes are published biweekly and cumulated annually.

> CONGRESSIONAL RECORD ABSTRACTS

The Congressional Record Abstracts are online abstracts of material in the Congressional Record from the 94th Congress, 2d session to the present. A typical entry includes the abstract, bill numbers, indexing terms, and page number references to the full text of the Congressional Record, and the date of the Record. It is available through the DIALOG service as file 135.

> DIGEST OF PUBLIC GENERAL BILLS AND RESOLUTIONS

The Digest of Public General Bills and Resolutions summarizes the essential features of public bills and resolutions and changes made in them during the legislative process. The Digest is published during each session of Congress in two cumulative issues and a final issue at the conclusion of the session. The publication may be examined at a Government depository library or purchased from the Government Printing Office. The Digest has sponsor/cosponsor, identical bills, short title, and subject indexes.

> MAJOR LEGISLATION OF THE CONGRESS (MLC)

The MLC, prepared by CRS, provides summaries of selected major legislation arranged by subject. It includes background on the issues and information on the content and status of major bills affecting that issue. The publication may be examined at a Government depository library or purchased from the Government Printing Office.

> NATIONAL JOURNAL

National Journal provides information on important executive branch and congressional actions. In addition to the annual index, the back cover of each issue contains a brief index to recent articles.

U.S. GOVERNMENT PUBLICATIONS

These publications may be found in the collections of Government depository libraries.

> GOVERNMENT REPORTS ANNOUNCEMENTS AND INDEX

Government research reports are indexed in the Government Reports Announcements and Index, which is issued twice monthly by the National Technical Information Service (NTIS). A keyword index lists significant words from titles. The NTIS index is available online commercially through DIALOG as file 6.

> INDEX TO U.S. GOVERNMENT PERIODICALS

The Index to U.S. Government Periodicals provides author, subject and title access to U.S. Government periodicals produced by more than one hundred agencies. It includes substantive articles, selected statistical publications, and topical updates. The Index is published quarterly and cumulated annually for the fourth quarter.

> MONTHLY CATALOG OF UNITED STATES GOVERNMENT PUBLICATIONS

The Monthly Catalog lists documents issued by all branches of the Federal Government. It has monthly, semi-annual, and annual indexes arranged by author, title, subject, key-words, and series/report title. The Monthly Catalog is available online commercially, through DIALOG file 66.

> WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS

The Weekly Compilation of Presidential Documents contains statements, messages and other Presidential materials released by the White House during the preceding week. The Weekly Compilation has weekly, quarterly, and annual indexes. It is also available online through NEXIS.

Statements of executive branch officials may also be found in such sources as executive agency publications and congressional hearings and in transcripts of news programs.

NEWSPAPER ARTICLES

The following indexes may be used to locate newspaper articles on education.

> BELL & HOWELL NEWSPAPER INDEXES

The Bell & Howell Indexing Center publishes indexes for the following papers: Chicago Tribune, Chicago Sun-Times, Christian Science Monitor, Denver Post, Detroit News, Houston Post, Los Angeles Times, New Orleans Times-Picayune, San Francisco Chronicle, and Washington Post.

> NATIONAL NEWSPAPER INDEX

National Newspaper Index is available online as file 111 of the DIALOG service; and provides frontpage to backpage indexing on current affairs topics in the Christian Science Monitor, Los Angeles Times, New York Times, Wall Street Journal, and Washington Post.

> NEWSSEARCH

Newssearch is the daily update of Magazine Index, National Newspaper Index, and Legal Resource Index in the DIALOG Information Retrieval Service. It provides front-page to back-page indexing of the Christian Science Monitor, Los Angeles Times, New York Times, Wall Street Journal, and Washington Post, as well as popular magazines, law journals, and law newspapers. It is file 211.

> NEW YORK TIMES INDEX

The New York Times Index provides extensive abstracts for articles appearing in the New York Times. The Index is published semi-monthly with quarterly and annual cumulations. It is also available online through NEXIS.

> NEXIS

The NEXIS online library contains the full text of over 130 publications which are individual files that can be searched separately. The files are combined into four groups by type (newspapers, magazines, wire services, and newsletters) and also by subject (business, finance, government, news, and trade/technology). Coverage includes domestic and international news. It also provides citations and abstracts of the available material, as well as, the full text of the article.

> OFFICIAL WASHINGTON POST INDEX

The Index provides access to all substantial newsworthy items in this paper and is also available through DIALOG (file 184). It is published monthly with annual cumulations.

STATISTICAL SOURCES

> AMERICAN STATISTICS INDEX (ASI)

The American Statistics Index indexes and describes the statistical publications of the U.S. Government, including periodicals, annual, biennial, semiannual, and special publications. It provides access to statistical materials by subject, name, issuing source, and title. The Index is published monthly and cumulated quarterly and annually. It is available online through the DIALOG Information Retrieval Service in file 102.

> INDEX TO INTERNATIONAL STATISTICS (IIS)

The Index to International Statistics indexes and describes current English language statistical publications of major intergovernmental organizations, including the UN system, the Organisation for Economic Co-operation and Development, the European Community, the Organization of American States, and development banks. It includes citations to periodicals, annuals, biennials, series, and monographs. The Index provides access to statistical materials by subject, geographic area, issuing source, title, and in some cases, publication number. It is published monthly and cumulated quarterly and annually.

> STATISTICAL REFERENCE INDEX (SRI)

The Statistical Reference Index provides a guide and index to selected statistical reference materials from non-Federal sources on a wide spectrum of subject matter. It includes the publications of trade, professional, and other nonprofit associations and institutes, business organizations, commercial publishers, university and independent research centers, and state government agencies. The Index provides access by subject, categories, name, issuing sources, and title. It is published monthly and cumulated quarterly and annually.

PART II: SPECIALIZED REFERENCE RESOURCES

APPROPRIATE SEARCH TERMS USED MOST FREQUENTLY ARE "EDUCATION" AND TERMS BEGINNING WITH THE WORDS EDUCATION OR EDUCATIONAL

INDEXES, ABSTRACTS, AND BIBLIOGRAPHIC DATABASES

Citations to journal articles and other material on education can be found in a number of printed indexes and abstracts, and in online bibliographic databases.

> AIM/ARM (ABSTRACTS OF INSTRUCTIONAL MATERIALS/ABSTRACTS OF RESEARCH MATERIALS)

AIM/ARM is a specialized index for locating materials on vocational and technical education. The database covers documents on all aspects and subfields of vocational and technical education and the related areas of manpower economics and development, employment, job training, and vocational guidance. It includes such subjects as agricultural education, business and office education, consumer education, and trade and industrial education. AIM/ARM is available online as file 9 of the DIALOG Information Retrieval Service.

> CURRENT INDEX TO JOURNALS IN EDUCATION (CIJE)

Current Index to Journals in Education (CIJE) is a monthly guide to current periodical literature in education, covering articles published in more than 700 major educational and education-related journals. It is part of the ERIC family of reference publications. Entries are arranged by the sixteen ERIC Clearinghouses and sequential "EJ" numbers. Subject, author, and source journal indexes are also provided; and it is cumulated semi-annually and annually. The index is available online in ERIC, file 1, of DIALOG.

> DISSERTATION ABSTRACTS ONLINE/DISSERTATION ABSTRACTS INTERNATIONAL

Dissertation Abstracts Online which corresponds to the printed resource Dissertation Abstracts International, is a definitive subject, title, and author guide to virtually every American dissertation accepted at an accredited institution since 1861, when academic doctoral degrees were first granted in the United States. Approximately 99% of all American dissertations are cited in this resource. Masters theses have been selectively indexed since 1962. In addition, the database serves to disseminate citations for thousands of Canadian dissertations and an increasing number of papers accepted in institutions abroad. Professional (e.g., M.D., LL.D.) and honorary degrees are not included. All subject areas are covered. This is file 35 in DIALOG. The printed version is issued monthly and cumulated annually; and provides keyword title and author indexes.

> EDUCATION INDEX

Education Index is an author/subject index to selected educational periodicals and yearbooks. It is published monthly (except in July and August) and cumulated annually. It is available online through Wilsonline.

> ERIC (EDUCATION RESOURCE INFORMATION CENTER)

ERIC is the complete database of educational materials collected by the Educational Resources Information Center. It consists of two subfiles: Resources in Education (RIE), which is concerned with the most significant and timely education research reports; and Current Index to Journals in Education (CIJE), an index to more than 700 periodicals of interest to every segment of the educational profession. All non-copyrighted items can be purchased from the ERIC Document Reproduction Service in paper copy or microfiche; and there are many libraries which have the ERIC microfiche. The database is available through the DIALOG Information Retrieval Service as file 1.

> EXCEPTIONAL CHILD EDUCATION RESOURCES/EXCEPTIONAL CHILD EDUCATION ABSTRACTS

Exceptional Child Education Resources (ECER), corresponding to the printed publication of the same name (formerly Exceptional Child Education Abstracts), is a comprehensive database on the education of exceptional children, produced by the Council for Exceptional Children (CEC). The database includes published and unpublished, copyrighted and noncopyrighted professional literature, nonprint media materials, and doctoral dissertations on all aspects of research, education, and services for gifted and handicapped children. The ECER database and the Educational Resources Information Center (ERIC) database supplement one another. Approximately one-half of the ECER records are also found in ERIC (DIALOG file 1); however, all journal citations in ECER include full abstracts. The Thesaurus of ERIC Descriptors is used to index ECER. This resource is available through DIALOG as file 54. The printed resource is published quarterly.

> LANGUAGE AND LANGUAGE BEHAVIOR ABSTRACTS (LLBA)

Language and Language Behavior Abstracts (LLBA), corresponding to the printed index of the same name, provides current selective access to the world's literature on language and language behavior in disciplines concerned with the nature and use of language. Articles are selected from approximately 1,200 domestic and international journals; and LLBA is issued quarterly with annual cumulations and a cumulative annual index. LLBA is file 36 in DIALOG.

> RESOURCES IN EDUCATION (RIE)

Resources in Education (RIE) is a monthly abstract journal announcing recent report literature related to the field of education; RIE gives a description and abstract of each document which appears in the "Document Resumes" section and is arranged by the sixteen ERIC Clearinghouses and sequential "ED" numbers. This resource also provides subject, author, institution, and document type indexes; and is cumulated semi-annually and annually. RIE is also available online in ERIC, file 1, of DIALOG.

REFERENCE WORKS

Burke, Arvid J., and Mary A. Burke. Documentation in education. New York, Teachers College Press, 1967. 413 p. Z711.B93 1967

"Shows how to locate information and data . . . and provides guidance for more sophisticated documentary or bibliographic work in education." While this resource is dated and some of the works listed are no longer published or have changed titles, it describes in detail the basic background and skills in searching and reviews over 200 general and specialized printed resources.

The Condition of education, 1984: statistical report. Edited by Valena White Plisko. Washington, U.S. Dept. of Education, for sale by the Supt. of Docs., 1984. 228 p. L112.N377a

"NCES 84-401"

Published annually.

Partial contents.--Elementary/secondary education.--Higher education.--Vocational education: secondary and postsecondary participation.--Educationally disadvantaged adults.--Secondary education: student flows, course participation, and state requirements.

Dejnozka, Edward L., and David E. Kapel. American educators' encyclopedia. Westport, Conn., Greenwood Press, 1982. 634 p. LB15.D37 1982

"Consists of almost 2,000 entries (short articles) that are based on the names and terms frequently found in the literature of professional education. Another section, Appendixes, contains selected factual information that is presented largely in tabular form." The entries are arranged in alphabetical order and cross-references are provided. A name and subject index is also included.

The Education almanac: 1984; facts and figures about our Nation's system of education. Reston, Va., National Association of Elementary School Principals, 1984. 217 p. LA210.E4375

"Attempts to bring together an array of basic background facts about the operation of our nation's schools."

Educational governance in the States: a status report on State boards of education, chief State school officers, and State education agencies. Prepared by the Council of Chief State School Officers. [Washington] U.S. Dept. of Education, G.P.O., 1983. [278] p. L101.U6S7

Provides 1982 "baseline data" on educational governance by examining legal, fiscal, staffing, and program data on state boards, chiefs, and education agencies.

The Encyclopedia of education; edited by Lee C. Deighton. [New York] Macmillan, 1971. 10 v. LB15.E47

"In more than 1,000 articles, [the Encyclopedia] offers a view of the institutions and people, of the processes and products, found in educational practice. The articles deal with history, theory, research, and philosophy, as well as with the structure and fabric of education . . . . [It] deals primarily with American education, but a considerable number of articles concern international education, comparative education, exchange programs, and the education systems of more than 100 countries." The articles in this resource are in alphabetic order, with related articles appearing together in clusters. Access to associated subject areas is provided in volume ten through a "Guide to Articles" which contains article titles and cross references. An index containing topical references as well as grouping articles under conceptual headings, is also in the last volume.

Encyclopedia of educational research. Edited by Harold E. Mitzel; sponsored by the American Educational Research Association. 5th edition. New York, Free Press, 1982. 4 v. L901.E57 1982

Presents "a critical synthesis and interpretation of reported educational research" which is provided in more than 250 commissioned entries. The entries are classified under eighteen broad headings and are arranged in alphabetical order by entry title. An index in the fourth volume provides name and subject access, as well as cross-references.

Estimates of school statistics: 1984-1985. Washington, National Education Association, 1985. 43 p. LB2842.N31185

This publication in its 43rd year, "presents current statistical information on public elementary and secondary education for the fifty states and the District of Columbia."

Frankel, Martin M., and Debra E. Gerald. Projections of education statistics to 1990-91. Volumes I and II. Washington, National Center for Education Statistics, 1982. 2 v. (166 p.) LA210.A28

This is the second biennial report in which "projections are presented for statistics on enrollments, graduates, teachers, and expenditures for the period of 1980-81 to 1990-91. Each chapter addresses a different facet of the education system. Chapter I describes the demographics of education. Chapter II presents projections of enrollments in elementary and secondary schools and institutions of higher education. Chapter III contains projections of graduates in high schools, colleges and universities. In Chapter IV, projections of supply and demand of teachers are illustrated. Finally, Chapter V presents projections of expenditures in elementary and secondary schools and institutions of higher educations."

Gatti, Richard D., and Daniel J. Gatti. New encyclopedic dictionary of school law. West Nyack, N.Y., Parker Publishing, 1983. 400 p. KF4117.G32 1983

Serves as a "comprehensive guide" to legal subjects and issues applicable to schools in the U.S. The contents are organized alphabetically with cross-references to related topics. A listing of broad general topics is provided in the category index and a table of cases is also given. Coverage includes such areas as administration of schools and school personnel, church and state relations, collective bargaining and school negotiations, constitutional rights of school personnel and students, discipline and control of students, equal protection and due process, and judicial considerations.

Goodnight, Lynn, David Hingstman, and Kathy Kellerman. Elementary and secondary education in the United States. Skokie, Ill., National Textbook, 1984. 342 p. LA217.G66

Contents.--Elementary and secondary education: a general view.--The need to reform: an examination of educational standards in elementary and secondary schools.--Financing America's education: a look at programs and policies.--Educating our teachers: the need for national certification standards.--Elementary and secondary education: who's who.--Elementary and secondary education: a selected bibliography.

Grant, W. Vance, and Thomas D. Synder. Digest of education statistics, 1983-84. Washington, National Center for Education Statistics, for sale by the Supt. of Docs., G.P.O., 1984. 212 p. L111.A6

An annual publication which "contains information on a variety of subjects within the field of education statistics, including the number of schools and colleges, teachers, enrollments, graduates, educational attainment, finances, Federal funds for education, employment and income of graduates, libraries, and international education . . . . Included among the data appearing for the first time in Digest are the following: State figures on the transportation of public school pupils; enrollment in public schools by grade span; a distribution of public schools by size of enrollment; schools, enrollment, staff, and finances in 120 of the Nation's largest school systems; trends in graduate enrollment in institutions of higher education; courses taken by participants in adult education; and data on the use of computers in public schools."

Indicators of education status and trends. Prepared by the U.S. Dept. of Education and the National Center for Education Statistics. Washington, The Department, 1985. 45, 22 p.

Partial contents.--Student performance.--High school graduation rates. --Remedical course enrollment of college freshmen.--Fiscal resources. --Teacher supply/demand and shortages.--Teacher earnings--comparisons with other occupations.--Public opinion ratings of schools.--Comparison, public/teacher opinion of problems.--School environment.--Student population characteristics.--Students enrollment by age.--State governance.

The International encyclopedia of education: research and studies; edited by Torsten Husen and T. Neville Postlewaite. Oxford, Pergamon Press, 1985. 10 v. LB15.I569 1985

The Encyclopedia attempts to provide answers to the questions: "What is the state of the art in the various fields of education? What scientifically sound and valid information is available? [and] What further research is needed in various aspects of education?" In this regard, it presents "a well-documented, international overview of the major aspects of the education enterprise by taking into account the various practices and research paradigms in different socioeconomic, cultural, and political contexts."

The entries are organized alphabetically into discrete topics with cross-references between relevant articles. In addition, a classified list of entries groups the contents by article title into twenty-five general headings and other appropriate subheadings. Subject and author indexes are provided as well as a list of major education journals.

Patterson's American education. Volume 81. Mount Prospect, Ill., Educational Directories, 1985. 489, 247 p. L901.P3

This annual publication presents "information about state departments of education, public school systems and their superintendents, public high and junior high schools and their principals, private high schools, public and private colleges, universities, professional, vocational and preparatory schools. All arranged and classified alphabetically," by state.

Powell, Majorie, and Joseph W. Beard. Teacher effectiveness: an annotated bibliography and guide to research. New York, Garland Publishing, 1984. 730 p. Z5814.T3P68 1984

The bibliography covers the years 1965 to 1980 and "focuses on teaching in preschools, of the major subject areas, such as reading, language arts, mathematics, social studies and science. It contains citations covering research [which is organized under the following headings:] teacher characteristics, expectations, perceptions of teaching and students, teacher behaviors, the influence of teacher behaviors on student behaviors and learning, teacher-student relations, student behaviors and perceptions, a selection of citations on methodological issues and summaries and essays. This reference work is also arranged by these headings and includes author, subject, and title indexes.

Review of research in education. Washington, American Educational Research Association, 1973-. v. 1-. LB1028.R43

This an annual series reviews research in education and as of 1984, includes eleven volumes. "The purpose of the *Review* is to survey disciplined inquiry in education through critical and synthesizing essays. It attempt[s] to inform its readers not only what has been and is being done but, perhaps more important, what will be and should be done in educational research. The substantive problems and domains of education [are] the primary focus of the *Review*, but it also report[s], assess[es], and evaluate[s] technical and methodological developments."

Standard education almanac: 1984-1985; edited by Gerald L. Gutek. 17th edition. Chicago, Professional Publications, Marquis Who's Who, 1984. 649 p. L101.U657

"*Standard Education Almanac* is [an annually published] comprehensive reference resource providing information and viewpoints in the field of education. Contents include current issues, statistics, specially selected articles and reports, and lists of resources covering all levels and aspects of education in the United States and Canada." It also includes more than 200 articles, tables, and graphs, and contains a selected bibliography. The *Almanac* is divided into six parts: introduction, elementary and secondary education, higher education, employment trends and adult education, and sources for further information. The introduction focuses on the current emphasis on educational excellence and such current trends and statistics as enrollments, expenditures, finance, public attitudes, and private schools.

AGENCIES AND ORGANIZATIONS

There are numberous agencies, organizations, and associations concerned with education. More specific discipline and directory information is available in the Washington Information Directory and the Encyclopedia Of Associations. A selection of teacher, administrator, evaluative, and parent groups, and government and quasi-government agencies from these directories appears below.

> American Association for the Advancement of Science
Science and Technology Education
1776 Massachusetts Ave., N.W.
Washington, DC 20036
(202) 467-4990
"Manages a coalition of scientific societies for education; directs science resources for schools; sponsors youth and teacher activities in science; publishes policy papers and conducts conferences."

> American Association of School Administrators
1801 N. Moore St.
Arlington, VA 22209
(703) 528-0700
Membership includes "chief school executives and other administrators at district or higher level and teachers of school administration. Conducts research on administrative issues."

> American Council on Education
1 Dupont Circle, N.W.
Washington, DC 20036
(202) 833-4700
Membership includes "colleges, universities, and education associations. Conducts and publishes research." Interests include precollege education.

> American Educational Research Association
1230 17th St., N.W.
Washington, DC 20036
(202) 223-9485
Membership includes "educational researchers affiliated with universities and colleges, school systems, and federal and state agencies. Publishes original research in education; sponsors publication of reference works in educational research; conducts continuing education programs; studies status of women and minorities in the education field."

> American Federation of Teachers, AFL-CIO
11 Dupont Circle, N.W.
Washington, DC 20036
(202) 797-4400
Membership includes "teachers and education professionals and personnel from preschool through postsecondary level. Conducts research on education issues."

› The Carnegie Foundation for the Advancement of Teaching
1785 Massachusetts Ave., N.W.
Washington, DC 20036
(202) 387-7200

"Conducts policy studies and issues reports on topics related to education."

› The College Board
1717 Massachusetts Ave., N.W.
Washington, DC 20036
(202) 332-7134

Membership includes "colleges and universities, secondary schools, school systems, and education associations. Contracts with the Educational Testing Service for the administration of college admission tests, and guidance and placement services; for the administration of testing programs which give students credit for advance college level work in high school; and for the administration of college equivalency exams. Develops guidance and counseling curricula for junior and senior high school students." Conducts research, and interests include precollege education.

› Council for American Private Education
1625 Eye St., N.W.
Washington, DC 20006
(202) 659-0016

Membership includes "national organizations serving private elementary and secondary schools."

› Council of Chief State School Officers
400 N. Capitol St., N.W.
Washington, DC 20001
(202) 393-8161

Membership includes "state superintendents and commissioners of education (primary and secondary)."

› The Council of the Great City Schools
1413 K St., N.W.
Washington, DC 20005
(202) 371-0163

Membership includes "superintendents and school board members of large urban school districts. Provides research and support services for members."

› Education Commission of the States
444 N. Capitol St., N.W.
Washington, DC 20001
(202) 624-5838

"Interstate compact of states and territories that assists public officials in developing education policy; conducts research on school finance, governance of postsecondary institutions, and school integration; issues research reports and a digest of state education legislation."

> Education Funding Research Council
1611 N. Kent St.
Arlington, VA 22209
(703) 528-1082

Membership includes "elementary and secondary school administrators, education associations, boards of education, state education agency administrators, and federal education aid coordinators. Informs members of federal and other funding for educational programs."

> Educational Resources Information Center (ERIC)
(Education Department)
1200 19th St., N.W.
Washington, DC 20208
(202) 254-5500

"Funds and coordinates a national information retrieval system, composed of clearinghouses on specific subjects. Washington center (main office) answers general queries and provides referrals to individual clearinghouses on counseling and personnel services, urban education, elementary and early childhood education, educational management, information resources, handicapped and gifted children, higher education, junior and community colleges, adult career and vocational education, languages and linguistics, reading and communication skills, rural education and small schools, science, mathematics, and environmental education, social science education, teacher education, and tests, measurement, and evaluation."

> Educational Testing Service (ETS)
1825 Eye St., N.W.
Washington, DC 20006
(202) 659-0616

"Administers examinations for admission to educational programs and for graduate and licensing purposes; conducts instructional programs in testing, evaluation, and research in education fields. Education Policy Research Institute designs ETS programs and conducts studies."

> Intergovernmental Advisory Council on Education
(Education Department)
400 Maryland Ave., S.W.
Washington, DC 20202
(202) 472-6464

Includes "federal, state, and local officials, and private and public educational representatives. Assesses the impact of federal policy on state and local education; makes recommendations to the Secretary and the President for improvement of federal educational programs. Reports available to the public."

> National Association of Elementary School Principals
1920 Association Dr.
Reston, VA 22091
(703) 620-6100

Interests include "federal and state polices and programs, contract negotiations, and professional development."

> National Association of Secondary School Principals
1904 Association Dr.
Reston, VA 22091
(703) 860-0200

Membership includes "principals and assistant principals of junior high, middle, and senior high schools, college-level teachers of secondary education, and seconary school administrators who operate from field offices. Conducts training programs for members; serves as clearinghouse for information on secondary school administration."

> National Association of State Boards of Education
701 N. Fairfax St.
Alexandria, VA 22314

Includes "members of state boards of education, state board attorneys, and executive secretaries to state boards. Provides information, technical and research assistance, and training programs for members. Interests include education governance, finance and policy, programs for the gifted and handicapped, alcohol and drug abuse, adolescent pregnancy, vocational education, and personnel development."

> National Center for Education Statistics
(Education Department)
400 Maryland Ave., S.W.
Washington, DC 20202
(202) 254-5213

"Collects education statistics (primarily at state and national level) on such subjects as enrollments, instructional staffs, high school and college graduates, and education finances."

> National Commission on Excellence in Education
(Education Department)
1200 19th St., N.W.
Washington, DC 20208
(202) 254-7920

"Members appointed by the Secretary of Education. Evaluates the curricula, standards, and expectations of secondary school systems with regard to college and university admission standards, and foreign school systems. Reports and makes recommendations to the President, the education secretary, and Congress."

> National Congress of Parents and Teachers
1201 16th St., N.W.
Washington, DC 20036
(202) 822-7878

Membership includes "parent-teacher associations (elementary and secondary levels). Maintains commissions on education, television, health and welfare, and individual development."

> National Council for Accreditation of Teacher Education
1919 Pennsylvania Ave., N.W.
Washington, DC 20006
(202) 466-7496

"Evaluates and accredits teacher education programs; publishes lists of accredited institutions and standards for accreditation."

> National Council of Teachers Of English
1111 Kenyon Rd.
Urbana, IL 61801
(217) 328-3870)

Membership includes "teachers of English at all school levels: elementary, secondary, and college. Works to increase the effectiveness of the teaching of English language and literature."

> National Council of Teachers of Mathematics
1906 Association Dr.
Reston, VA 22091
(703) 720-9840

"Membership includes teachers of mathematics in elementary and secondary schools and two-year colleges, and university teacher education faculty."

> National Council of State Education Associations
1201 16th St., N.W.
Washington, DC 20036
(202) 822-7192

"Membership includes presidents and executive directors of state education associations."

> National Education Association
1201 16th St., N.W.
Washington, DC 20036
(202) 822-7200

Membership includes "teachers, from elementary through postsecondary level, and other education professionals. Conducts research on education issues."

> National Institute of Education
(Education Department)
1200 19th St., N.W.
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"Conducts and funds basic and applied research in areas such as: career education, educational technology, school financing, and upgrading of basic skills, especially reading and mathematics; provides information and resources to educators; works to improve education research at all levels from early learning through adult programs."

> National School Boards Association
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"Federation of state school board associations. Interests include school finance, collective bargaining, and legislation affecting schools."

> National Science Teachers Association
1742 Connecticut Ave., N.W.
Washington, DC 20009
(202) 328-5800

"Membership includes science teachers from elementary through college level. (Affiliated with the American Association for the Advancement of Science.)"

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"Administers federal education policy in the U.S."

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American education (ten times a year)
American educational research journal (quarterly)
American journal of education (quarterly)
Change (eight times a year)
Clearing house (nine times a year)
Daedalus (quarterly)
Education and urban society (quarterly)
Education daily (daily)
Education law bulletin (irregular)
Education week (weekly)
Educational record (quarterly)
Harvard educational review (quarterly)
Journal of law and education (quarterly)
NASSP [National Association of Secondary School Principals] bulletin (nine times a year)
Phi Delta Kappan (ten times a year)
Principal (quarterly)
Teachers College record (quarterly)

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SB-176
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PUBLICATIONS RELATING TO THE 1985-86 COLLEGE DEBATE TOPIC

That More Rigorous Academic Standards Should Be Established For All Public Elementary and/or Secondary Schools in the United States, In One or More of the Following Areas: Language Art, Mathematics, Natural Science.

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___American Education. (Monthly except August-September and January-February which are combined issues.) *This publication covers preschool to adult education, new research and demonstration projects, major education legislation, school and college bond data, grants, loans, contracts, and fellowships.* Subscription price: Domestic - $23.00 a year; Foreign - $28.75 a year. Single copy price: Domestic - $2.50 a copy; Foreign - $3.13 a copy. [AMED] (File Code 2G)
ED 1.10: S/N 765-001-00000-5

___Analysis of Course Offerings and Enrollments as Related to School Characteristics: Contractor Report. *Report consists of an analysis of school reported course offerings and student data which was used to determine the status of mathematics, science, vocational education, and computer science at the secondary level. Also identifies school characteristics that are associated with differential course offerings and enrollments in these subjects.* 1985: 107 p.; ill.
ED 1.115:C 83/2 S/N 065-000-00232-9 $ 4.00

___Analysis of Course-Taking Patterns in Secondary Schools as Related to Student Characteristics: High School and Beyond. *Intended to provide educators, policymakers, and the general public with information on the current status of mathematics, science, vocational education, computer science, and general education in the secondary schools.* 1985: 136 p.; ill.
S/N 065-000-00225-6 4.75

___Condition of Education, 1984: A Statistical Report. *An annual statistical report which describes trends in various sectors and at various levels in education. Contains an overview of trends in elementary, secondary, and higher education, provides statistics on special programs and populations, and reports on current issues in secondary education.* 1984: 236 p.; ill.
ED 1.109:984 S/N 065-000-00200-1 7.00

___Digest of Education Statistics, 1983-1984. *Provides an abstract of statistical information covering the broad range of American education from prekindergarten through graduate school.* 1983: 226 p.
ED 1.113:983-84 S/N 065-000-00191-8 6.50

___Education for Economic Security Act, Public Law 98-377. An Act to Provide Assistance to Improve Elementary, Secondary, and Postsecondary Education in Mathematics and Science; to Provide a National Policy for Engineering, Technical, and Scientific Personnel; to Provide Cost Sharing by the Private Sector in Training Such Personnel; to Encourage Creation of New Engineering, Technical, and Scientific Jobs; and for Other Purposes. Approved August 11, 1984. 1984: 37 p.
GS 4.110:98/377 S/N 022-003-96132-1 $ 3.50

___Education in the U.S.S.R.: Research and Innovation. 1978: 37 p. HE 19.102:Un 3/4 S/N 017-080-01815-2 4.25

___Nation at Risk: The Imperative for Educational Reform, A Report to the Nation and the Secretary of Education, United States Department of Education by the National Commission on Excellence in Education. *Identifies the problems currently affecting American education and offers recommendations for improvement.* 1983: 70 p.
ED 1.2:N 21 S/N 065-000-00177-2 4.50

___ Alliance for Excellence: Librarians Respond to "A Nation at Risk", Recommendations and Strategies From Libraries and the Learning Society. *Report, with recommendations, on how public libraries, academic libraries, library and information training institutions, and school library media centers could respond to "A Nation at Risk" and ways libraries by linking their resources should help to create a learning society.* 1984: 74 p.
ED 1.2:N 21/3 S/N 065-000-00207-8 2.50

___ Nation Responds: Recent Efforts to Improve Education. *This comprehensive report describes responses to recent studies in education and profiles State initiatives.* 1984: 229 p.
ED 1.2:N 21/2 S/N 065-000-00198-5 7.50

___Projections of Education Statistics to 1992-1993. 1985: 154 p.; ill.
S/N 065-000-00238-8 3.50

___Resources in Education. (Monthly.) *Provides up-to-date information about educational research sponsored by the Bureau of Research, Office of Education. Designed to keep teachers, administrators, research specialists, the public, and others in the educational community informed about the latest significant findings from educational research.* Subscription price: Domestic - $56.00 a year; Foreign - $70.00 a year. Single copy price: Domestic - $8.50 a copy; Foreign - $10.63 a copy. [RIE] (File Code 2M) ED 1.310: S/N 765-003-00000-8

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ED 1.310: S/N 765-004-00000-4

___School Mathematics: Options for the 1990s, Volume 1, Chairman's Report of a Conference. 1984: 54 p.
ED 1.2:M 42/v.1 S/N 065-000-00220-5 2.00

___Science and Engineering Education for the 1980's and Beyond. 1980: 90 p.
NS 1.2:Ed 8/20 S/N 038-000-00467-1 5.50

___Second International Mathematics Study, Summary Report for the United States: Contractor's Report. *Report includes information on item-level outcomes (achievement and attitudes) for students.* 1985: 168 p.; ill.
ED 1.115:M 42 S/N 065-000-00234-5 $ 6.00

___Statistics of Public School Systems in the Twenty Largest United States Cities, Fall 1980. *Contains statistical data on the 1980-1981 school year, including numbers of pupils, staff, and schools in the twenty largest cities. National trend data since fall 1976 on selected items of information are also included for these cities.* 1982: 23 p.; ill. ED 1.112/4:980 S/N 065-000-00168-3 3.50

___Strength Through Wisdom: A Critique of United States Capability, A Report to the President From the President's Commission on Foreign Language and International Studies. *Explains why competence in foreign languages and international understanding is important to all Americans in relation to national security and economic viability.* 1979: 156 p. HE 19.102:F 76 S/N 017-080-02065-3 7.00

___ Supplement to the above. 1979: 312 p.
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